INSTRUCTION MANUAL

EMR 660-01-M9
CBW DISCRIMINATOR
(Includes Model 636-01-M1
Presample Filter)

SANGAMO WESTON
Schlumberger

EMR TELEMETRY

MP MASTER
MA20088

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JULY 1978

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ADDENDUM

MODEL 660-01-M9 CBW DISCRIMINATOR

The -M9 provides a Linear specification of ±0.1% with a 300 mV rms minimum input signal.

No physical change is required. The 660 is tested to the specification requirements.

INSTRUCTION MANUAL

EMR 660
CONSTANT BANDWIDTH (CBW)
DISCRIMINATOR
(REVISION B)

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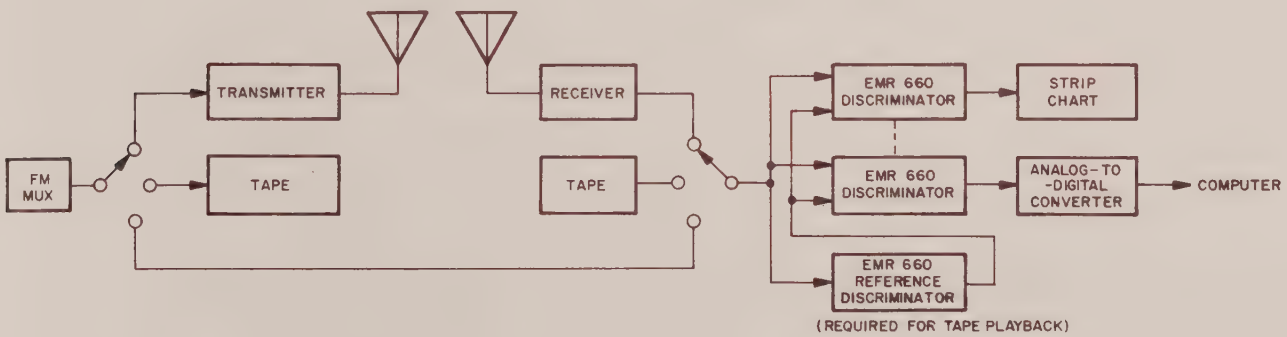
EMR 660 CONSTANT BANDWIDTH (CBW) DISCRIMINATOR (REVISION A)

1. GENERAL

The EMR 660 CBW Discriminator is part of the EMR 600-Series telemetry products designed for use in FM data acquisition applications. The 660 is used to separate individual subcarriers from an FM multiplex and demodulates the intelligence. The input center frequency range is from 500 Hz to 250 kHz. Deviations from ±2% to ±15% permit operation on most standard IRIG CBW channels. Adjustments for balance and bandedge output volts are accessible from the front of the card. The unit supplies a data output that can be used to drive display or data reduction devices. Any of the demodulated CBW channels may be used as the reference discriminator for tape-speed compensation without requiring special delay networks or delay lines. However, the reference discriminator bandwidth and low-pass output filter characteristic should be the same as that of the data discriminators.

2. APPLICATION

A typical application of the EMR 660 is shown in the following diagram. This diagram illustrates the 660 and other EMR 600-Series equipment connected to form a typical data acquisition system.



3. TYPICAL CHARACTERISTICS

3.1 Electrical

Typical electrical characteristics for the EMR 660 are as follows:

a. Center Frequency: 500 Hz to 250 kHz.

b. Deviation: ±2% to ±15% CBW only.

c. Input Level: 30 mV rms to 3V rms with automatic threshold provided.

d. Input Impedance: Greater than 50 kΩ.

e. Zero Stability: Not greater than 100 ppm/°F of center frequency.

f. Linearity: ±0.25% of full scale best straight line.

g. Total Dynamic Error: Not greater than 1%, DR = 2 or greater.

h. Output Filter: 5-pole constant amplitude (CA) or constant delay (CD), cutoff frequencies provided in the range of 5 Hz to 4 kHz.

i. Output Polarity: Output becomes more positive with an increase in input frequency.

j. Output Voltage:

1. Models 660-01 and -02 -- Adjustable between ±1.5 volts and ±10 volts (peak).

2. Models 660-11 and -12 -- Adjustable between ±0.15 volt and ±2 volts (peak).

k. Output Current: 10 mA with short-circuit protection.

l. Tape-Speed Compensation: 14 dB, DR = 2 or greater.

m. Card-Mounted Controls:

1. Balance -- Adjusts the output to 0V with center frequency input.

2. Output Level -- Adjusts the full-scale output voltage for full bandedge-to-bandedge deviation.

3. Test Points -- Input, Output, and Ground.

n. Power Requirement: ±15V ±1%, 60 mA plus load current. Power is derived from an external source.

3.2 Mechanical and Environmental

a. Card Size: 4-1/2 inches high by 6-1/2 inches long.

b. Connectors: Cards contain a printed connector that plugs into a mating receptacle in the mounting equipment.

c. Mounting: Intended for mounting in EMR 600-Series System Equipment Cases. Several equipment cases are available for use with various system configurations.

d. Operating Temperature Range: 50°F to 120°F (10°C to 50°C).

3.3 Model Number Identification

The complete model number and digit description is as follows:

MODEL 660 - XX - XXXX ± XXXX - XXXX - X
(a: XX; b: XXXX; c: XXXX; d: XXXX; e: X)

a = Design sequence as follows --

-01: Does not contain calibration relay
-02: Contains calibration relay
} Output voltage adjustable between ± 1.5 volts and ± 10 volts.

-11
-12
} These two configurations are the same as the -01 and -02, respectively, except for the output voltage. Output voltage is adjustable between ± 0.15 volt and ± 2 volts.

b = Center frequency in four-digit kHz.

c = Deviation in four-digit Hz.

d = Output filter cutoff in four-digit Hz.

e = Output filter --

1 = CA
2 = CD

4. INSTALLATION

The EMR 660 is designed for installation in an EMR 600-Series System Equipment Case. A printed connector on the card mates with a 22-pin receptacle located in the equipment case. Electrical connections to the card are terminated at the mating receptacle. The electrical connections to be terminated are listed on the following page:

PIN	SIGNAL	PIN	SIGNAL
1	SUBCARRIER OUTPUT	12	CAL OUTPUT
2	SUBCARRIER OUTPUT RTN	13	- - -
3	- - -	14	CAL COMMAND *
4	SUBCARRIER INPUT RTN	15	CAL COMMAND RTN *
5	SUBCARRIER INPUT	16	DATA OUTPUT RTN
6	-15V SUPPLY	17	DATA OUTPUT
7	+15V SUPPLY	18	- - -
8	GRD	19	- - -
9	- - -	20	- - -
10	- - -	21	- - -
11	- - -	22	TSC INPUT

* Used for 660-02 and -12 only.

5. OPERATION

5.1 Description

Operation of the discriminator consists of terminating all inputs and outputs of the card and performing the initial adjustments. Terminations are provided in paragraph 4. The initial adjustments include both a discriminator balance and an output voltage selection. These adjustments are made at two card-edge-mounted potentiometers accessible from the front of the card.

A balance adjustment is performed to set the discriminator output voltage to 0 volt with a center frequency subcarrier input. The output voltage adjustment is made to set the peak output voltage when the subcarrier input is at a bandedge of the subcarrier channel. A complete initial adjustment procedure is provided in paragraph 5.2.

5.2 Initial Adjustments

The procedure in this paragraph is used to set the initial parameters of the discriminator prior to using the discriminator in a data reduction application. To perform this procedure, a signal generator, rms voltmeter, and a DC voltmeter are required test equipments.

a. Ascertain the center frequency (CF) of the unit and calculate the bandedge frequencies of the channel. Bandedge frequencies are calculated as follows:

Upper Bandedge -- CF + DEVIATION

Lower Bandedge -- CF - DEVIATION

b. Terminate the discriminator output into the normal load.

c. Connect the signal generator to the discriminator multiplex input. Set the frequency of the generator output at the center frequency of the channel and adjust the amplitude to 1V rms.

d. Disconnect any signal from the tape-speed compensation (TSC) input and ground the TSC input pin.

e. Monitor the discriminator data output (at TP2) with a DC voltmeter and adjust card potentiometer R3 for a 0V ±50 mV indication.

f. Change the frequency input at the signal generator to the upper bandedge of the channel.

g. Adjust card potentiometer R30 for the desired bandedge output voltage (at TP2). The output voltage capability is dependent on the particular model. See paragraph 3.1, step j.

6. THEORY OF OPERATION

6.1 General

The EMR 660 card contains one FM discriminator circuit which detects data in a subcarrier channel. The data output is an analog voltage proportional to the frequency change in the subcarrier channel. At center frequency, the output voltage is 0 volt. Positive deviation polarity is used; therefore, as the frequency at the input increases above center frequency, the output voltage increases. Similarily, as the frequency decreases below center frequency, the output voltage decreases below 0 volt. The maximum voltage swing for bandedge-to-bandedge deviation at the output is adjustable by an output potentiometer.

An overall block diagram of the discriminator is shown in Figure 1. Functional circuits and components are illustrated, as well as significant signal connections between circuits and components. Designations within the functional circuits in Figure 1 are reference designations of the components in the circuits as shown in the schematic diagram, Figure 5.

NOTE

Integrated circuits (U1-U5) in Figure 5 contain two sets of pin numbers, one set outside of the logic symbol and one set inside. Mechanical provisions are included on the card for installing integrated circuits in a TO-99 or TO-100 package or a 14-pin DIP. Pin numbers outside of the logic symbol are for the 14-pin DIP. Pin numbers inside the symbol are for the TO-99 or TO-100 package. Descriptions in this paragraph use the DIP pin numbers.

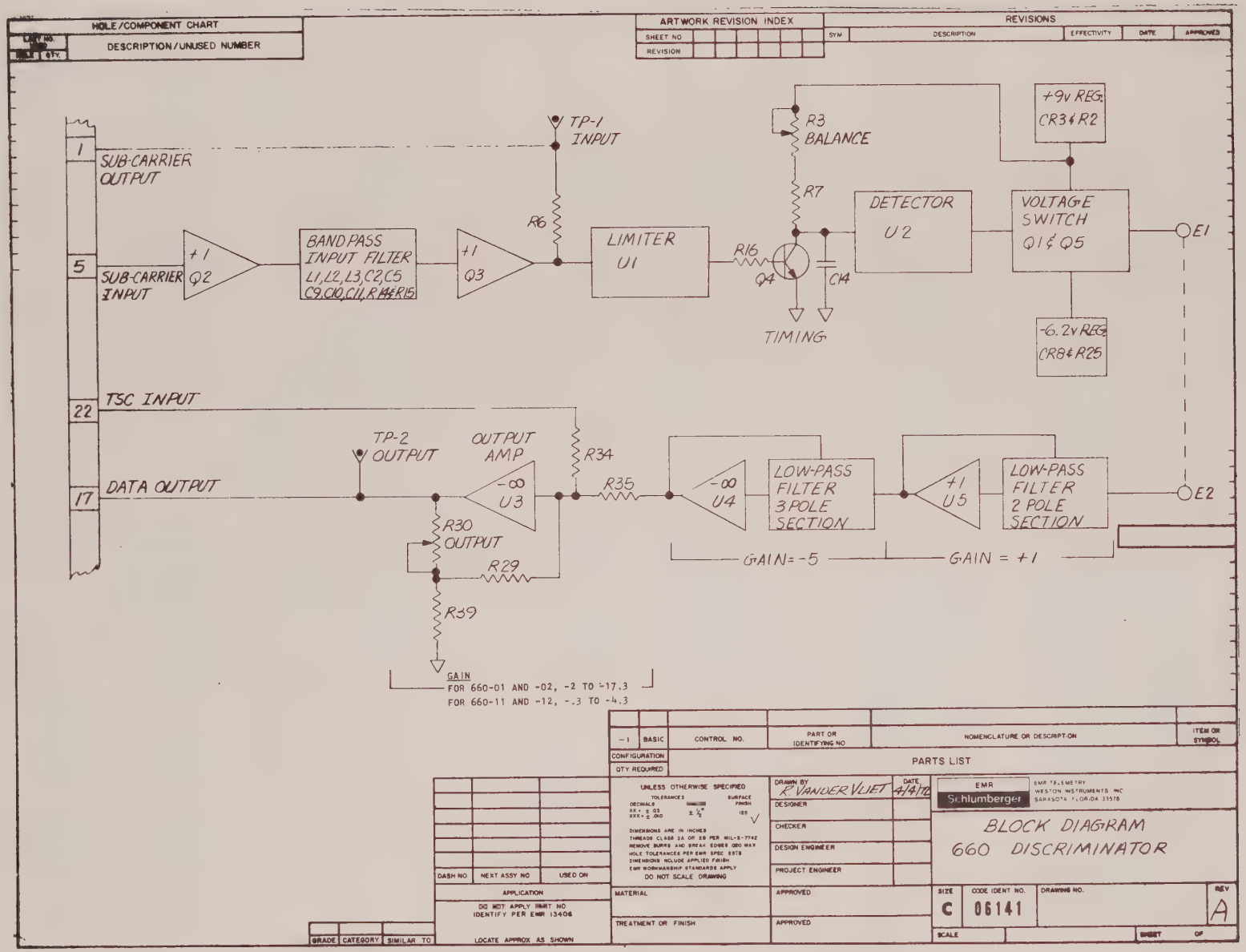


Figure 1. EMR 660 Discriminator Block Diagram

6.2 Input Amplifier and BPIF

The subcarrier multiplex is coupled from card pin 5 through a +1-input follower (Q2) to the bandpass input filter (BPIF). Follower Q2 provides input buffering and isolation between the signal source and the BPIF. The BPIF is a stager tuned, passive LC filter tuned to extract only the frequencies of the selected subcarrier channel. All other frequencies of the input multiplex are rejected. A second +1 buffer Q3 supplies the selected signal from the BPIF to a limiter circuit, to a test jack (TP1), and to a card output pin. This is an output supplied for use as desired by the operator.

The typical response of the BPIF is shown in Figure 2. Attenuation (in dB) is illustrated on the left side of the graph based on the frequencies across the bottom. F_C is center frequency, while ΔF, $2\Delta F$, and $3\Delta F$ identify specific changes in frequency from the center frequency. The nominal passband of the filter is $F_C \pm \Delta F$.

6.3 Limiter

The limiter (U1) is a squaring circuit which receives the selected subcarrier input and converts the signal to a square-wave output. The square wave is of the same frequency as the input and the zero crossings of the signal input are maintained. This squaring function is performed to enable proper operation of the FM detector.

Limiter stage U1 is a Schmitt trigger which has a fixed threshold of approximately 30 millivolts. Proper switching occurs as long as the input is 30 millivolts rms or greater. The normal limiter output is a square wave operating between -0.5V and +3.5V.

6.4 FM Detector

The FM detector uses the limiter (U1) output to determine the amount and direction of the frequency changes in the incoming subcarrier. Half-wave, pulse-averaging detection is employed in the FM detector. In this type of detection, pulses are generated during one-half cycle based on the transitions of the subcarrier signal. During the other one-half cycle, pulses of a fixed duration are formed based on timing components in the FM detector. The resulting FM detector output is a serial pulse train with varying positive pulse durations and fixed negative pulse durations.

The FM detector consists of transistor Q4, integrated circuit U2, and associated timing components. The serial output from the FM detector is coupled directly to the voltage switch (Q1/Q5 and CR4/CR5).

On the positive half cycles of the limiter (U1) output, transistor Q4 is saturated and a positive voltage is applied to pin 5 (+ input) of U2. (Diode CR7 is forward biased which raises the level at pin 5 to the positive region.) The U2 output is

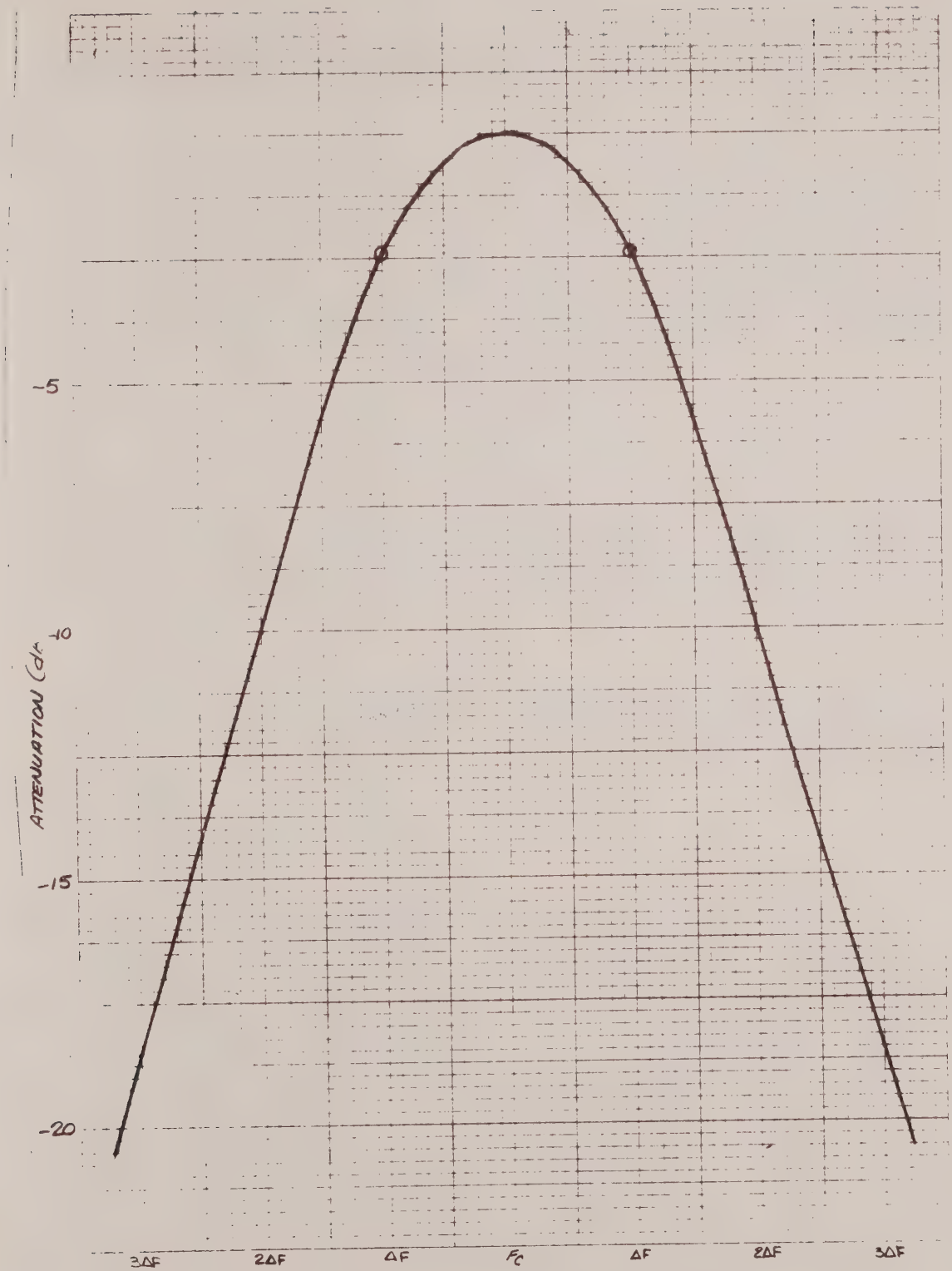


Figure 2. Typical BPIF Response Curve

thus positive and will remain positive until the termination of the positive half cycle. During the negative half cycle, the U1 output is low and Q4 is turned off. The U2 output reverts to a negative level as the limiter output goes low.

With Q4 off, capacitor C14 begins to charge to the +9V source through R7 and BAL potentiometer R3. The positive side of C14 is connected directly to the second plus (+) input, pin 3, of U2. As the C14 positive charge increases sufficiently, the U2 output again goes positive. The U2 output will remain positive through the remaining negative half cycle and through the entire positive half cycle as previously described. Thus, the U2 output is negative only during the time required for C14 to charge sufficiently during the negative half cycle of the U1 output. When Q4 is on during the positive half cycle, C14 is discharged and remains discharged until Q4 is turned off.

As a result, the positive half cycles of the U2 output vary with the subcarrier rate. However, the negative half cycles are fixed.

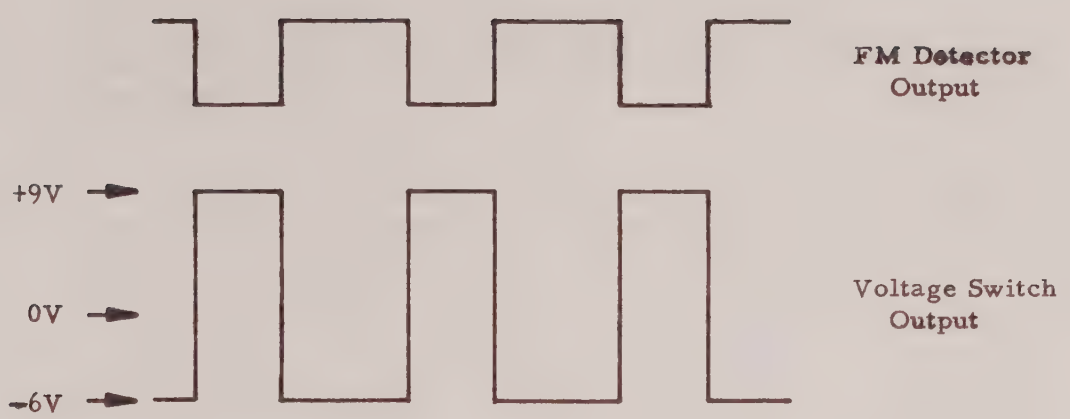
The circuit is designed so that at center frequency the FM detector positive pulse output is approximately 60% of a cycle, while the negative pulse is fixed at 40% of a cycle. The 60% will vary as the subcarrier rate varies but the 40% (of a center frequency cycle) will not vary. Therefore, at upper bandedge, the two periods may approach a 50/50 ratio; while at lower bandedge, the ratio will be greater than 60/40.

The balance potentiometer R3 is used to adjust the RC time constant of the C14/R7/R3 network, thus setting the point at which the U2 output will switch. This control, therefore, adjusts the negative pulse period of the FM detector output which provides a fine adjustment of the discriminator output with a center frequency input.

6.5 Voltage Switch

A voltage switch (Q1/CR4 and Q5/CR5) operates at the FM detector output. This circuit is a switching network which establishes precise positive and negative levels for the pulses output from the FM detector. When the FM detector output pulse is high, transistor Q5 is turned ON and a −6.2-volt level is output. As the pulse goes low, Q1 is turned ON and a +9-volt level is output. Therefore, the serial output from the voltage switch is a pulse train switching between +9 volts and −6.2 volts. The difference in voltage levels is provided because of the 60/40 timing relationship in the FM detector.

For example, the detector output and resulting voltage switch outputs at center frequency are as shown on the following page:



In this example, the voltage switch output is at a +9-volt level for 40% of a cycle, while the output is at −6 volts for 60% of a cycle. Averaging the effective energy of the pulses, the output is zero. However, if the subcarrier rate decreases, the negative pulse duration of the voltage switch output will increase and the effective energy of the resulting pulse train will decrease below zero. Conversely, if the subcarrier rate increases, the negative pulse duration will decrease and the effective energy of the output will increase above zero.

6.6 LPOF and Output Amplifier

The voltage switch output is supplied to the low-pass output filter (LPOF) and output amplifier. The LPOF is a cascaded network consisting of two filter sections and two amplifiers. Filtering action of the LPOF removes the subcarrier rate from the signal and supplies a voltage output representative of the modulation in the subcarrier channel. A 2-pole and a 3-pole section are provided which together form a 5-pole low-pass filter. The filter cutoff frequency is set by the ordering information for the unit. Rolloff of the filter is 30 dB/octave beyond cutoff. All modulating frequencies up to the filter cutoff are passed without attenuation. Modulating frequencies above the cutoff are attenuated at the rolloff rate. Active amplifiers in the LPOF provide isolation between filter sections and feedback to the active networks.

The output amplifier is a variable gain circuit as controlled by the output potentiometer R30. Output voltages from ±0.15 volt to ±10 volts may be supplied for full channel deviation depending on the card configuration and the gain setting. The maximum gain of the combined LPOF and output amplifier is +100. Data from the output amplifier is routed to both a card test jack (TP2) and to card output pin 17.

6.7 Tape-Speed Compensation

A tape-speed-compensation (TSC) input is also provided to the discriminator. This input is routed directly to the output amplifier. The TSC signal is derived

from a discriminator which is operating from a reference frequency in the subcarrier multiplex. This feature is used when the subcarrier multiplex has been recorded on magnetic tape.

In a system in which the subcarrier multiplex is to be recorded real-time and played back, a precision reference frequency is normally recorded with the data subcarrier multiplex. During recording or playback of the magnetic tape, time base errors may be introduced into the subcarrier multiplex due to wow and flutter variations of the tape recorder. Any errors introduced because of this are reflected in all subcarrier channels of the multiplex and in the precision reference frequency. Therefore, a discriminator may be set to operate from the reference frequency. This discriminator detects any erroneous modulation of the reference frequency and supplies a data output signal representative of the error. The error signal output is commonly referred to as the TSC signal.

Data subcarrier channels are demodulated by data discriminators simultaneously with the demodulation of the reference frequency. Errors detected by the reference discriminator are also contained in each subcarrier channel. Therefore, the TSC output from the reference discriminator is routed to the output amplifier of each data discriminator. This TSC signal is thus mixed with the data signal in each data discriminator. The TSC signal is out of phase with the error portion of the data signal at the amplifier input and, therefore, removes that part of the demodulated data signal which is erroneous. For a ±3% wow and flutter, a ±2-volt TSC signal is required to remove the erroneous data. Lesser wow-and-flutter rates require lower magnitude TSC signal inputs.

6.8 Calibration Relay

The 660-02 and 660-12 configurations contain a relay at the output amplifier output. This relay, when energized, connects the data output signal to a calibration output. The normal data output is not interrupted by the relay. The relay is normally open and the calibration output is not terminated in the discriminator. When a calibration command is routed to card pin 14, the relay is closed and the data output is routed to the calibration output, pin 12.

7. MAINTENANCE

The maintenance information provided includes a list of adjustments, a discriminator test procedure, a low-pass output filter and output amplifier test, and troubleshooting information. Each of these major information groups is described in a separate subparagraph of this section. During any test or adjustment, refer to the discriminator card assembly diagram (Figure 4) to locate particular card connector pins, test jacks, or components. The card schematic diagram is shown in Figure 5.

7.1 Adjustments

There are two adjustments to be made in the discriminator. These adjustments include a balance adjustment and an output voltage adjustment. Both adjustments are operating type adjustments and are described with the operating information (paragraph 5) in this card description.

7.2 Discriminator Test Procedure

The discriminator test procedure may be performed as desired to check the unit for proper operation or may be performed to assist in locating a malfunction. Required test equipment to perform the test procedure includes a signal generator and an oscilloscope. Perform the procedure as follows:

a. Using a signal generator, apply a 3-volt peak-to-peak signal to the unit input at J1 pin 5. The frequency of this signal should be the center frequency of the discriminator.

b. Refer to Table 1 and check the waveforms in sequence as presented in the table. The vertical sensitivity for the oscilloscope is provided adjacent each waveform. Also provided is the zero reference for the oscilloscope display. The horizontal sweep speed setting is variable depending on the frequency of the input. After connecting the oscilloscope to the indicated test point, rotate the horizontal sweep speed control to display the waveform as shown in the table.

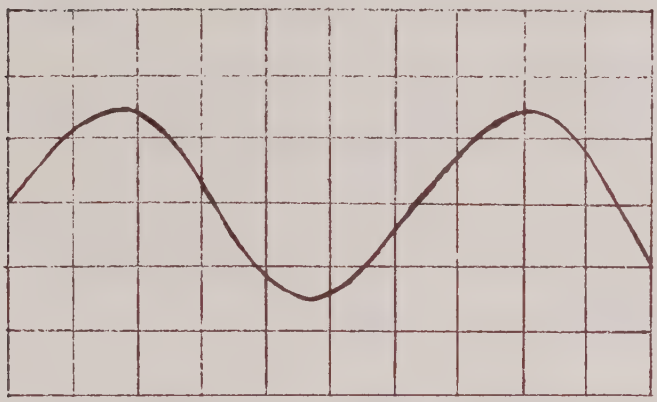
c. Waveforms 1 through 9 are for the input circuits, limiter circuit, FM detector, and voltage switch. These waveforms depict actual signal types and levels in the unit with a center frequency input. Waveforms 10, 11, and 12 illustrate the low-pass output filter (LPOF) and output amplifier signals. However, since there is no modulation of the center frequency input, the signals in the LPOF and output amplifier are all approximately 0 volt. For a LPOF and output amplifier check, refer to paragraph 7.3.

7.3 Low-Pass Output Filter and Output Amplifier Test

This paragraph contains a test procedure which may be used to test the output circuits of the discriminator. A basic test of all circuits may be performed by referring to paragraph 7.2.

In performing this test, the low-pass output filter (LPOF) and output amplifier should be isolated from the remaining circuits of the card. A jumper is connected from card terminal E1 to terminal E2 (ref. Figure 1) which connects the LPOF to the voltage switch output. To perform this test, the jumper is

Table 1. Discriminator Waveforms

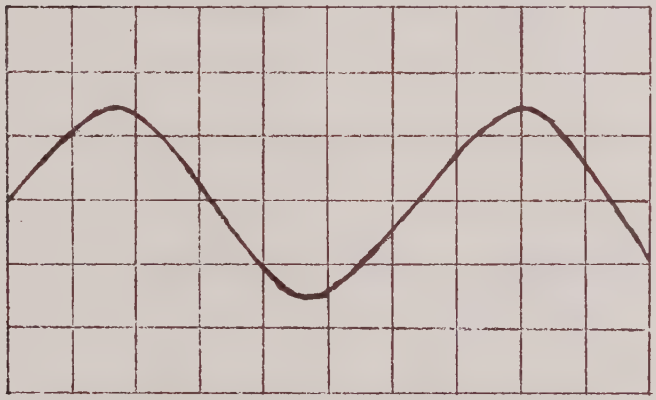


(1) 0V

Vert. 1V/Div.

J1 - Pin 5

Subcarrier Input

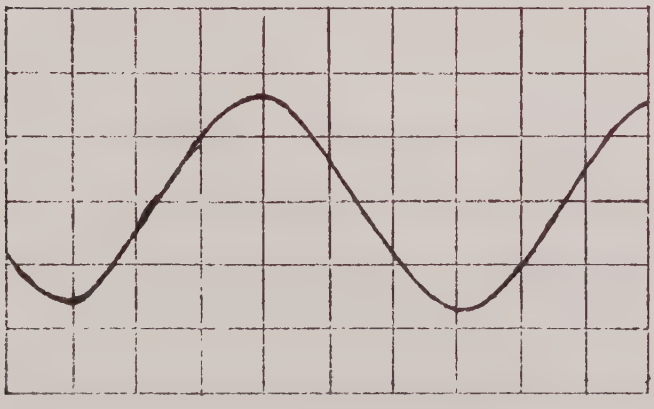


(2) -2.2V

Vert. 1V/Div.

Q2 Emitter

Input Buffer Output



(3) -0.6V

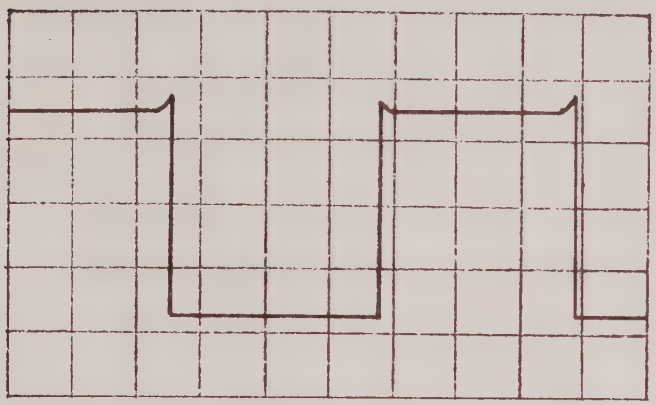
Vert. 1V/Div.

TP1

BPIF Output

Table 1 (Cont'd.). Discriminator Waveforms

④

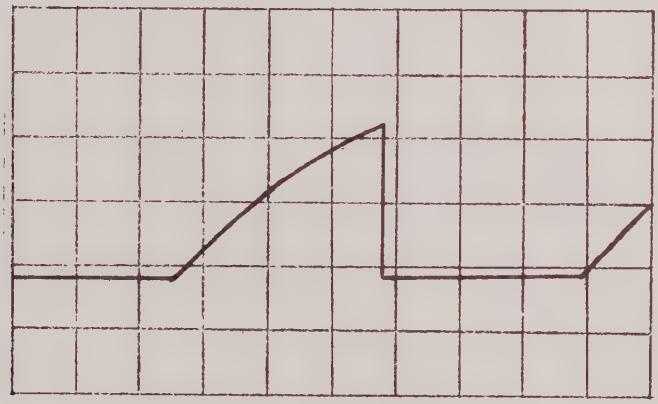


Vert. 1V/Div.

U1 Output

Limiter Output

⑤

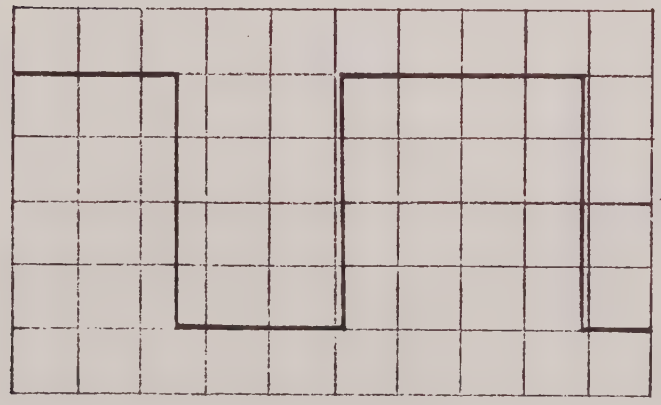


Vert. 2V/Div.

Q4 Collector

Detector Timing

⑥



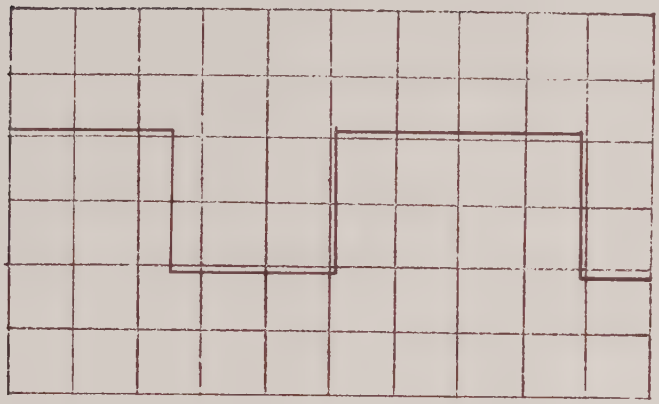
Vert. 1V/Div.

U2 Output

Detector Output

Table 1 (Cont'd.). Discriminator Waveforms

(7)

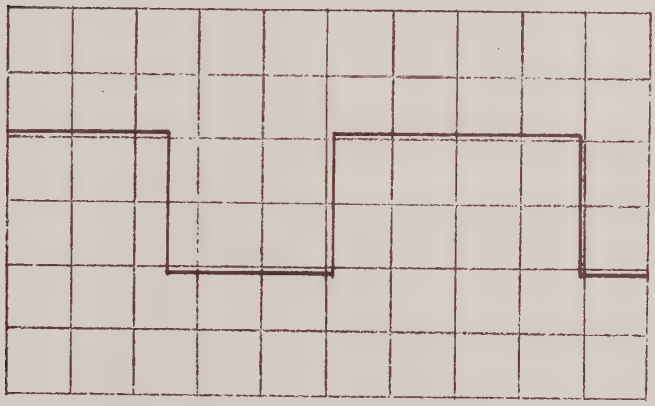


Vert. 0.2V/Div.

Q1 Base

Voltage Switch Input

(8)

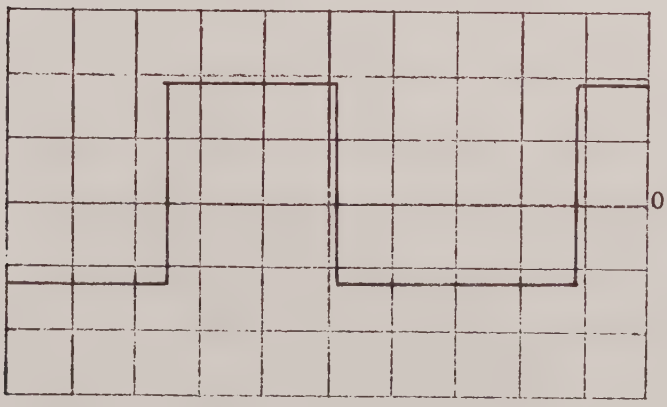


Vert. 0.2V/Div.

Q5 Base

Voltage Switch Input

(9)



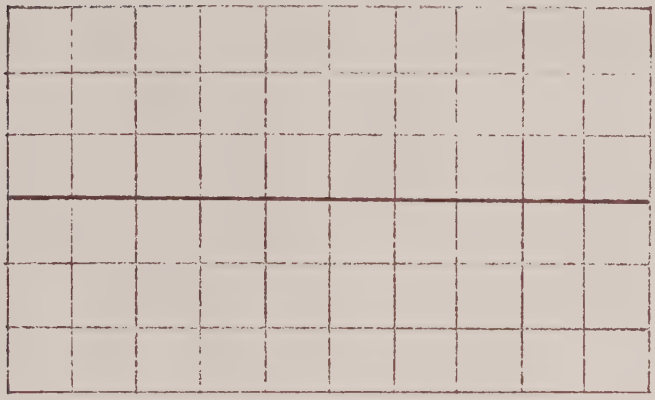
Vert. 5V/Div.

Q1 or Q5 Collector

Voltage Switch Output

Table 1 (Cont'd.). Discriminator Waveforms

(10)



Vert. 0.05V/Div.

U5 Output

LPOF, First Section

(11)

Vert. 0.05V/Div.

U4 Output

LPOF, Second Section

(12)

Vert. 0.05V/Div.

U3 Output

Output Amp Output

removed. Instead, a signal generator and two resistors are connected to terminal E2 as shown in Figure 3. This network thus replaces the circuits which normally drive the LPOF and output amplifier.

On the top of Figure 3 is a block diagram of the LPOF and output amplifier. Sections of the filter and active components are illustrated along with the reference designations of the components. Gain in each stage is indicated under each functional block.

Two graphs are provided in the lower section of Figure 3. These graphs illustrate the frequency response curves of the two types of output filter characteristics available for the discriminator, constant amplitude (CA), and constant delay (CD). Each discriminator contains components which set the response characteristic. Therefore, when performing this test, ascertain which output filter characteristic applies to the particular discriminator being tested.

The LPOF and output amplifier test is divided into two sections, a gain test and a response test. The gain test is provided in paragraph 7.3.1, while a response test is provided in paragraph 7.3.2.

7.3.1 Gain Test

a. Remove the jumper between terminals E1 and E2. Refer to Figure 3 and connect a signal generator and terminating components to terminal E2.

b. Set the signal generator to 1/10 of the filter cutoff frequency with an amplitude of 10 volts peak-to-peak.

c. Using an oscilloscope, monitor the U5 output. Gain in this stage is +1. However, the terminating components at the input divide the 10-volt peak-to-peak input signal by a factor of 100:1. Thus, the U5 input and output should be 100 millivolts peak-to-peak at the input frequency.

d. Using an oscilloscope, monitor the U4 output. Gain in this stage is −5. Therefore, the output of U4 should be 500 millivolts peak-to-peak but 180° out of phase with the input.

e. Using an oscilloscope, monitor the data output at card pin 17 or test jack TP2. Rotate output potentiometer R30 fully counterclockwise, then fully clockwise checking the output signal amplitude. The gain values for all card configurations are shown in Figure 3. A second phase inversion is performed in the output amplifier. Therefore, the output signal is in phase with the input.

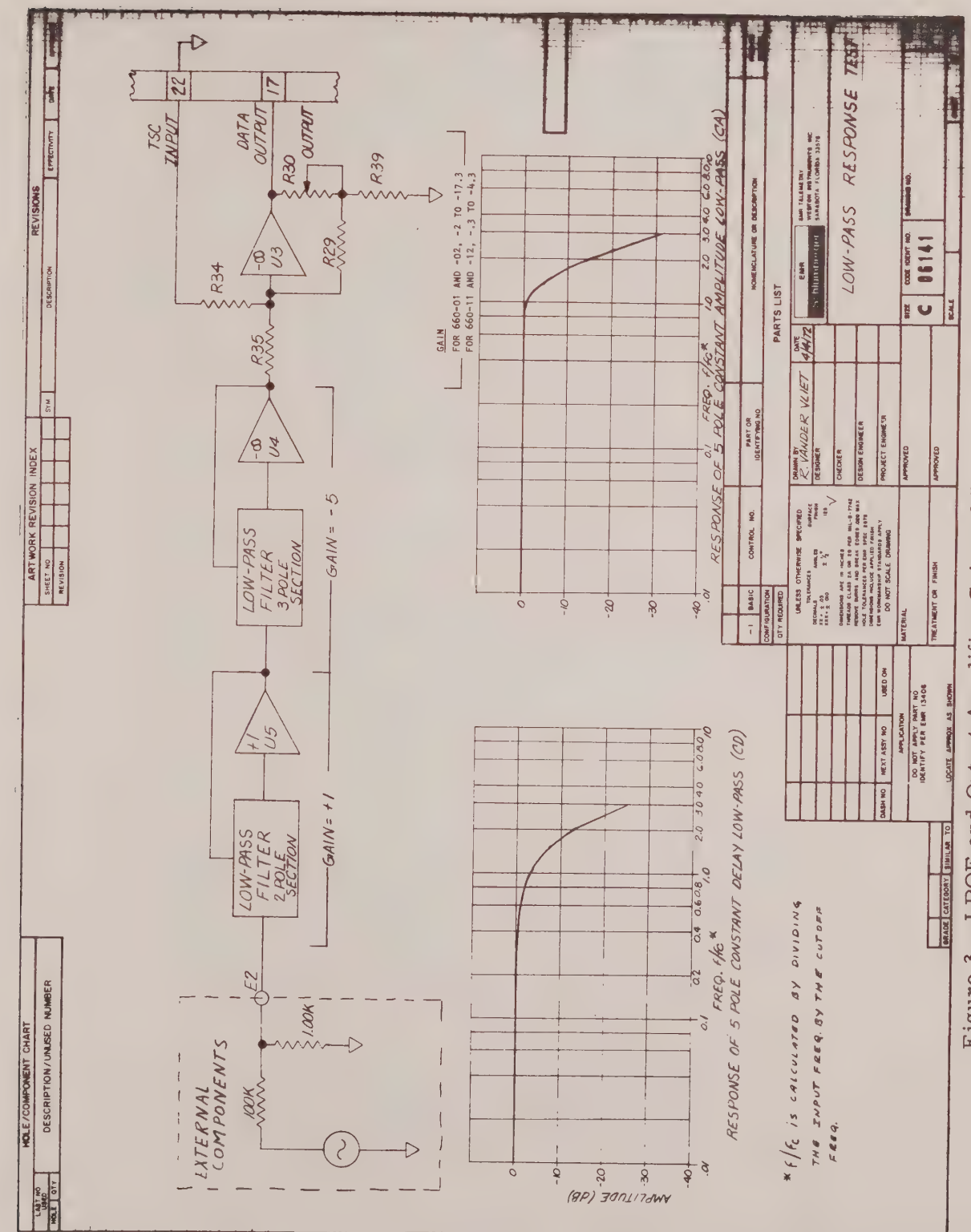


Figure 3. LPOF and Output Amplifier Gain and Response Test Diagram

f. Maintain the connections and signal levels as set in step (e) above if a filter response test (paragraph 7.3.2) is to be performed. If the response test is not required, remove the signal generator and terminating components and reconnect the jumper from E1 to E2.

7.3.2 Response Test

Prior to performing this test, perform a gain test as provided in paragraph 7.3.1 and retain the connections and settings at the completion of the gain test. In addition to the signal generator and oscilloscope, an rms voltmeter is required to perform the test.

a. Ascertain the type of output filter response and cutoff frequency included in the unit being tested.

b. Refer to Figure 3 and locate the appropriate graph for the discriminator (CA or CD) output filter.

c. Using an rms meter, monitor the output amplifier output signal. Record the dB level of the output.

d. Increase the frequency of the signal generator until the output amplifier output is −0.5 dB for CA filters or −3 dB for CD filters. The frequency of the signal generator at this point should be the filter cutoff frequency ± 10% of the cutoff frequency.

e. Increase the frequency of the signal input to 2 x the cutoff frequency.

f. Again, using an rms voltmeter, check and record the dB levels of the input and output signals. Compare the results with the appropriate graph in Figure 3. These graphs illustrate typical attenuation characteristics; actual results may vary ± 10% from that illustrated. However, significant differences between actual values derived and that illustrated in the graphs indicate a malfunction in response determining components.

g. After completion of the test, disconnect the signal generator and terminating components; reconnect the jumper between terminals E1 and E2. The unit is now ready for normal operation.

7.4 Troubleshooting

Should a malfunction occur in the discriminator, the most efficient method for locating the defective components is by performing the tests as provided in paragraphs 7.2 and 7.3. Perform the overall test in paragraph 7.2 first and check all waveforms. When an improper indication is located during the test, check the components in the circuit at which the indication was observed. To assist in checking certain components, a table of transistor voltages is provided. These voltages are listed along with the reference designations in Table 2. Notes in Table 2 indicate the conditions under which the voltages are obtained.

After locating the defective component, refer to paragraph 8 for replacement component information. When removing and replacing a component, use minimum heat so that other components or the board printed-wiring are not damaged.

The bandpass input filter (BPIF) is not field repairable. Therefore, if a malfunction occurs in the BPIF components, return the card to EMR for repair and re-adjustment.

8. PARTS LISTS

A complete list of all components on the EMR 660-01, 660-02, 660-11, and 660-12 are contained in Tables 3 through 6, respectively, which list all components by ITEM NO. (reference designation). The total quantity of a component on the card is provided in the QTY. REQ'D. column. Each part is assigned an EMR stock number as listed in the EMR NUMBER column. When a component is manufactured by EMR or is purchased through an EMR specification, the EMR-assigned number is provided in the DRAWING or SPEC NO. column. A complete component description is provided in the DESCRIPTION column. The original manufacturer and manufacturer's part number are provided in the VENDOR NAME and VENDOR PART NUMBER columns. Abbreviations of the manufacturers are used in the VENDOR NAME column. A complete description of the vendors is provided in Table 7.

Table 2. Discriminator Transistor Voltage Measurements

TRANSISTOR	EMITTER	BASE	COLLECTOR
Q1	+9.1V	+8.5V	0V
Q2	-2.2V	-1.5V	+15.0V
Q3	-0.6V	0V	+15.0V
Q4	GND	+0.2V	+ 2.6V
Q5	-6.5V	-6.0V	0V

NOTES:

1. Use oscilloscope for voltage measurements.
2. Values listed are average DC voltages of the observed waveforms.

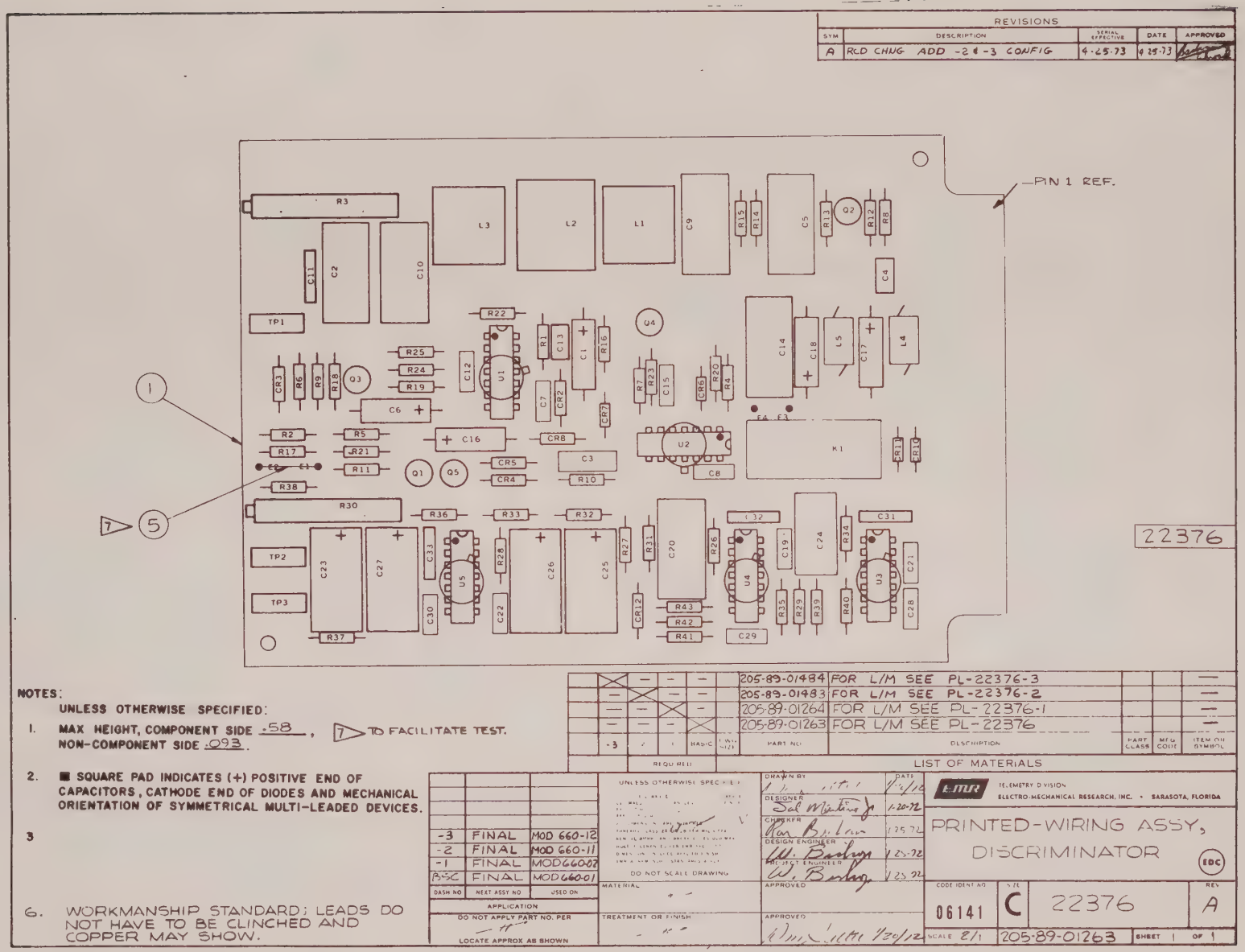

REVISIONS
SYM | DESCRIPTION | SERIAL EFFECTIVE | DATE | APPROVED
A | RLD CHNG ADD -2 & -3 CONFIG | | 4-25-73 | 4-25-73
PIN 1 REF.
22376
NOTES:
UNLESS OTHERWISE SPECIFIED:
1. MAX HEIGHT, COMPONENT SIDE .58, NON-COMPONENT SIDE .093.
7 TO FACILITATE TEST.
2. ■ SQUARE PAD INDICATES (+) POSITIVE END OF CAPACITORS, CATHODE END OF DIODES AND MECHANICAL ORIENTATION OF SYMMETRICAL MULTI-LEADED DEVICES.
3
6. WORKMANSHIP STANDARD; LEADS DO NOT HAVE TO BE CLINCHED AND COPPER MAY SHOW.
205-89-01484 FOR L/M SEE PL-22376-3
205-89-01483 FOR L/M SEE PL-22376-2
205-89-01264 FOR L/M SEE PL-22376-1
205-89-01263 FOR L/M SEE PL-22376
-3 | BASIC | PART NO | DESCRIPTION
REQU REF
LIST OF MATERIALS
-3 FINAL MOD 660-12
-2 FINAL MOD 660-11
-1 FINAL MOD660-007
BSC FINAL MOD 660-01
DASH NO | NEXT ASSY NO | USED ON
APPLICATION
DO NOT APPLY PART NO. PER
LOCATE APPROX AS SHOWN
UNLESS OTHERWISE SPECIFIED
DO NOT SCALE DRAWING
MATERIAL
TREATMENT OR FINISH
DRAWN BY
DESIGNER Sal Martino Jr 1-20-72
CHECKER Ron Bulow 1-25-72
DESIGN ENGINEER W. Bodrey 1-25-72
PROJECT ENGINEER W. Bodrey 1-25-72
APPROVED
APPROVED 1/26/72
EMR TELEMETRY DIVISION
ELECTRO-MECHANICAL RESEARCH, INC. • SARASOTA, FLORIDA
PRINTED-WIRING ASSY, DISCRIMINATOR
EDC
CODE IDENT NO 06141
SIZE C
22376
REV A
SCALE 2/1
205-89-01263
SHEET 1 OF 1

Figure 4. EMR 660 CBW Discriminator Assembly Diagram

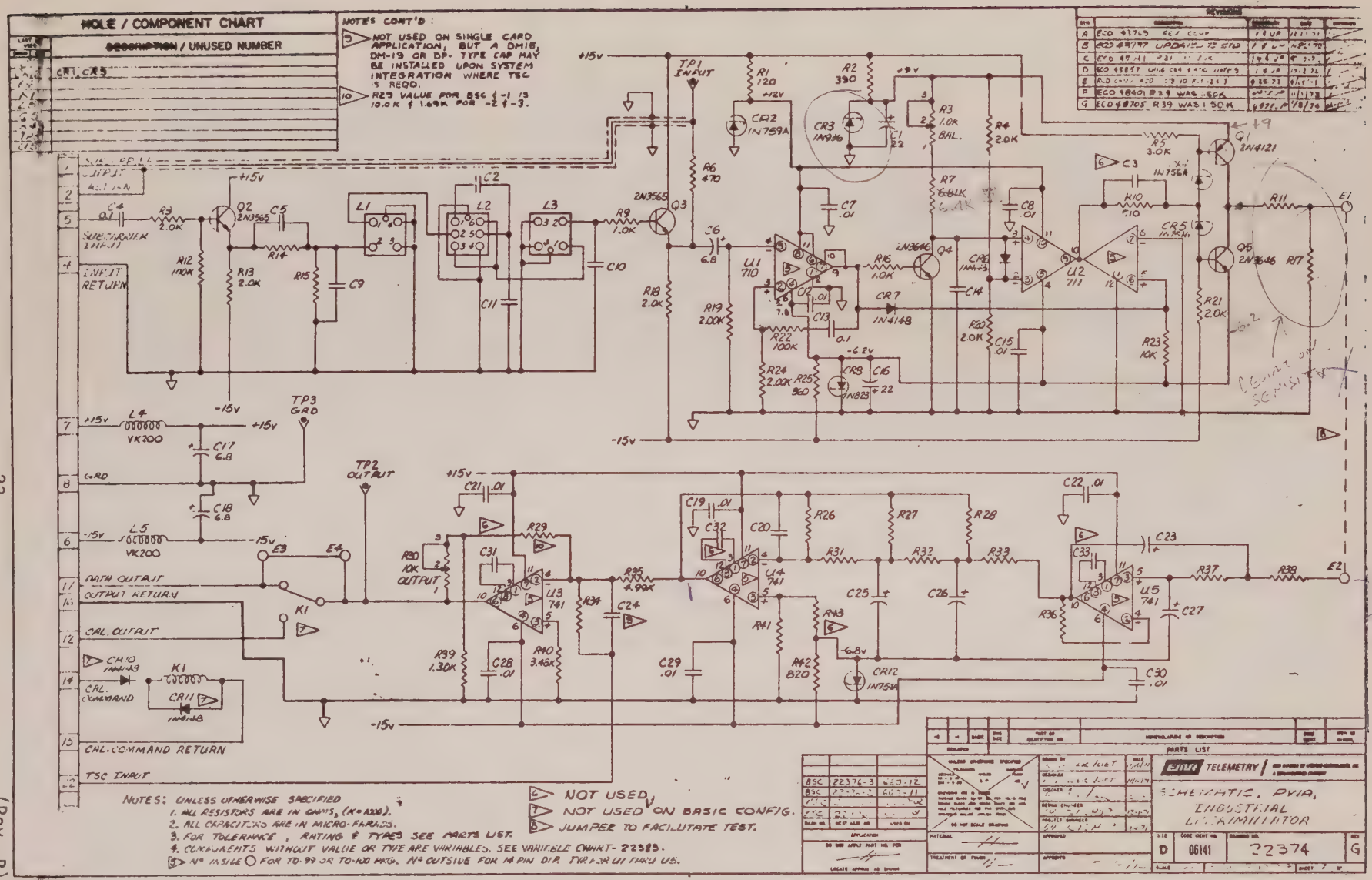


Figure 5. EMR 660 CBW Discriminator Schematic Diagram

DICK DUNGAN

Table 3. EMR 660-01 Parts List

PARTS LIST 22376 REV DATE 05/14/75 REV LTR F

LIST TITLE PWA, DISCRIMINATOR CHGE CONT NO. CODE IDENT SHT 1 OF 3
PART NO. 205-89-01263 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	EMR NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00862	22375	PWB, DISCRIMINATOR	EMR	204-99-00862
5	AR	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008
C 1	1	337-12-22004	601	CAP., 22MF 10% 15V	EMR	337-12-22004
C 2	1	999-01-00001	22383	CAP.,*F/VAR*		
C 4	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 5	1	999-01-00002	22383	CAP.,*F/VAR*		
C 6	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 7	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 8	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 9	1	999-01-00003	22383	CAP.,*F/VAR*		
C 10	1	999-01-00004	22383	CAP.,*F/VAR*		
C 11	1	999-01-00027	22383	CAP.,*F/VAR*		
C 12	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 13	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 14	1	999-01-00005	22383	CAP.,*F/VAR*		
C 15	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 16	1	337-12-22004	601	CAP., 22MF 10% 15V	EMR	337-12-22004
C 17	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 18	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 19	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 20	1	999-01-00014	22383	CAP.,*F/VAR*		
C 21	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 22	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
C 23	1	999-01-00015	22383	CAP.,*F/VAR*		
C 25	1	999-01-00015	22383	CAP.,*F/VAR*		
C 26	1	999-01-00015	22383	CAP.,*F/VAR*		
C 27	1	999-01-00016	22383	CAP.,*F/VAR*		
C 28 THRU C 30	3	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U01Q3Z/TA-.01
CR 2	1	088-99-00119	642-13	DIODE,ZENER 0.4W 12.0V	EMR	088-99-00119
CR 3	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	MML 2	1N936/1N936A/1N936B
CR 4	1	088-99-00209	642-10	DIODE,ZENER 0.4W 8.2V	EMR	088-99-00209
CR 5	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
CR 6	1	088-10-41480		DIODE,SW,75V/50UA,4NS/10MA	JEDEC	1N4148
CR 7	1	088-10-41480		DIODE,SW,75V/50UA,4NS/10MA	JEDEC	1N4148
CR 8	1	088-97-08230		DIODE,REF. 6.2V@7.5MA	MML 2	1N823
CR 12	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
L 1	1	999-01-00006	22383	L,ASSY,*F/VAR*		
L 2	1	999-01-00007	22383	L,ASSY,*F/VAR*		
L 3	1	999-01-00004	22383	L,ASSY,*F/VAR*		
L 4	1	044-98-00006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 19/3B
L 5	1	044-98-00006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 19/3B
Q 1	1	263-97-41210		XSTR,PNP,RF SWITCH/AMPL	MML4	2N4121
Q 2	1	263-10-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565

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Table 3 (Cont'd.). EMR 660-01 Parts List

205-89-01263 22376 SHT 2 OF 3

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
Q 3	1	263-10-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565
Q 4	1	263-10-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
Q 5	1	263-10-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
R 1	1	616-02-12009		RES,120 OHM 5% 1/4W	ALLEN BRAD	RC07GF121J
R 2	1	616-02-39009		RES,390 OHM 5% 1/4W	ALLEN BRAD	RC07GF391J
R 3	1	201-98-00138		POT,TRMR,1.0 K 10%.75W	BECK/MML27	79PR1K
R 4	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 5	1	616-02-30000		RES,3K 5% 1/4W	ALLEN BRAD	RC07GF302J
R 6	1	616-02-47009		RES,470 OHM 5% 1/4W	ALLEN BRAD	RC07GF471J
R 7	1	608-09-68100	624	RES. 6.81K 1% 1/10W	EMR	608-09-68100
R 8	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 9	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 10	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R 11	1	999-01-00009	22383	RES.,*F/VAR*		
R 12	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 13	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 14	1	999-01-00010	22383	RES.,*F/VAR*		
R 15	1	999-01-00011	22383	RES.,*F/VAR*		
R 16	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 17	1	999-01-00012	22383	RES.,*F/VAR*		
R 18	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 19	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 20	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 21	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 22	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 23	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R 24	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 25	1	616-02-36009		RES,360 OHM 5% 1/4W	ALLEN BRAD	RC07GF361J
R 26	1	999-01-00017	22383	RES,*F/VAR*		
R 27	1	999-01-00018	22383	RES,*F/VAR*		
R 28	1	999-01-00019	22383	RES,*F/VAR*		
R 29	1	608-09-10001	624	RES. 10K 1% 1/10W	EMR	608-09-10001
R 30	1	201-98-00148		POT,TRMR, 10 K 10%.75W	BECK/MML27	79PR10K
R 31	1	999-01-00020	22383	RES,*F/VAR*		
R 32	1	999-01-00021	22383	RES,*F/VAR*		
R 33	1	999-01-00022	22383	RES,*F/VAR*		
R 34	1	999-01-00013	22383	RES,*F/VAR*		
R 35	1	608-09-49900	624	RES. 4.99K 1% 1/10W	EMR	608-09-49900
R 36	1	999-01-00023	22383	RES,*F/VAR*		
R 37	1	999-01-00024	22383	RES,*F/VAR*		
R 38	1	999-01-00025	22383	RES,*F/VAR*		
R 39	1	608-09-13000	624	RES 1.30K 1% 1/10W	EMR	608-09-13000
R 40	1	608-09-34800	624	RES, 3.48K 1% 1/10W	EMR	608-09-34800
R 41	1	999-01-00026	22383	RES,*F/VAR*		
R 42	1	616-02-82009		RES,820 OHM 5% 1/4W	ALLEN BRAD	RC07GF821J
TP 1	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102
TP 2	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102
TP 3	1	143-98-00005		JACK,TEST,BLACK	MML 16	8041-1G6/MML 16
U 1	1	046-97-00138		IC,LIN COMPTR,DIFF HS	TI/MML40	SN72710L

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Table 3 (Cont'd.). EMR 660-01 Parts List

205-89-01263 22376 SHT 3 OF 3

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
U 2	1	046-97-00141		IC,LIN COMPTR,W/STROBE	TI/NML40	SN72711L
U 3	3	046-97-00135		IC,LIN AMPL,OPNL,COMPEN	TI/NML40	SN72741L
THRU						
U 5						
REF 1	1	905-01-00908	22374	SCHEMATIC,PWA,DISCR	EMR	905-01-00908
REF 2	1	905-05-00308	22383	VARIABLE CHART,MOD 660	EMR	905-05-00308
REF 3	1	905-07-00230	22857	SPEC,ENGRG,MODEL 660	EMR	905-07-00230
REF 4	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

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Table 4. EMR 660-02 Parts List

PARTS LIST 22376-1 REV DATE 09/04/75 REV LTR E

LIST TITLE PWA, DISCRIMINATOR CHGE CONT NO. CODE IDENT SHT 1 OF 3
PART NO. 205-89-01264 ECO RECORD 2 06141 CKD BY

ITEM NO.	QTY REQD	EMR NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00862	22375	PWB, DISCRIMINATOR	EMR	204-99-00862
5	AR	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008
C 1	1	337-12-22004	601	CAP., 22MF 10% 15V	EMR	337-12-22004
C 2	1	399-01-00001	22383	CAP.,*F/VAR*		
C 4	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 5	1	399-01-00002	22383	CAP.,*F/VAR*		
C 6	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 7	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 8	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 9	1	399-01-00003	22383	CAP.,*F/VAR*		
C 10	1	399-01-00004	22383	CAP.,*F/VAR*		
C 11	1	399-01-00027	22383	CAP.,*F/VAR*		
C 12	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 13	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 14	1	399-01-00005	22383	CAP.,*F/VAR*		
C 15	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 16	1	337-12-22004	601	CAP., 22MF 10% 15V	EMR	337-12-22004
C 17	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 18	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 19	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 20	1	399-01-00014	22383	CAP.,*F/VAR*		
C 21	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 22	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 23	1	399-01-00015	22383	CAP.,*F/VAR*		
C 25	1	399-01-00015	22383	CAP.,*F/VAR*		
C 26	1	399-01-00015	22383	CAP.,*F/VAR*		
C 27	1	399-01-00016	22383	CAP.,*F/VAR*		
C 28 THRU C 30	3	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
CR 2	1	088-99-00119	642-13	DIODE,ZENER 0.4W 12.0V	EMR	088-99-00119
CR 3	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	MML 2	1N936/1N936A/1N936B
CR 4	1	088-99-00209	642-10	DIODE,ZENER 0.4W 8.2V	EMR	088-99-00209
CR 5	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
CR 6	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 7	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 8	1	088-97-08230		DIODE,REF. 6.2V@7.5MA	MML 2	1N823
CR 10	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 11	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 12	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
K 1	1	219-99-00013	28531-6	RELAY,1 FORM C,GOLD CONT	EMR	219-99-00013
L 1	1	399-01-00006	22383	L,ASSY,*F/VAR*		
L 2	1	399-01-00007	22383	L,ASSY,*F/VAR*		
L 3	1	399-01-00008	22383	L,ASSY,*F/VAR*		
L 4	1	044-98-00006		CHOKE,FERRITE,0.75K/5MHZ	FERROXCUBE	VK200 10/3B

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Table 4 (Cont'd.). EMR 660-02 Parts List

205-89-01264 22376-1 SHT 2 OF 3

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
L 5	1	044-98-00006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 1C/3B
Q 1	1	263-97-41210		XSTR,PNP,RF SWITCH/AMPL	MML4	2N4121
Q 2	1	263-10-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565
Q 3	1	263-10-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565
Q 4	1	263-10-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
Q 5	1	263-10-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
R 1	1	616-02-12009		RES,120 OHM 5% 1/4W	ALLEN BRAD	RC07GF121J
R 2	1	616-02-39009		RES,390 OHM 5% 1/4W	ALLEN BRAD	RC07GF391J
R 3	1	201-98-00138		POT,TRMR,1.0 K 10%.75W	BECK/MML27	79PR1K
R 4	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 5	1	616-02-30009		RES,3K 5% 1/4W	ALLEN BRAD	RC07GF302J
R 6	1	616-02-47009		RES,470 OHM 5% 1/4W	ALLEN BRAD	RC07GF471J
R 7	1	608-09-68100	624	RES. 6.81K 1% 1/10W	EMR	608-09-68100
R 8	1	616-02-20009		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 9	1	616-02-10009		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 10	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R 11	1	999-01-00009	22383	RES,*F/VAR*		
R 12	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 13	1	616-02-20009		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 14	1	999-01-00010	22383	RES,*F/VAR*		
R 15	1	999-01-00011	22383	RES,*F/VAR*		
R 16	1	616-02-10009		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 17	1	999-01-00012	22383	RES,*F/VAR*		
R 18	1	616-02-20009		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 19	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 20	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 21	1	616-02-20009		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 22	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 23	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R 24	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 25	1	616-02-36009		RES,360 OHM 5% 1/4W	ALLEN BRAD	RC07GF361J
R 26	1	999-01-00017	22383	RES,*F/VAR*		
R 27	1	999-01-00018	22383	RES,*F/VAR*		
R 28	1	999-01-00019	22383	RES,*F/VAR*		
R 29	1	608-09-10001	624	RES. 10K 1% 1/10W	EMR	608-09-10001
R 30	1	201-98-00148		POT,TRMR, 10 K 10%.75W	BECK/MML27	79PR10K
R 31	1	999-01-00020	22383	RES,*F/VAR*		
R 32	1	999-01-00021	22383	RES,*F/VAR*		
R 33	1	999-01-00022	22383	RES,*F/VAR*		
R 34	1	999-01-00013	22383	RES,*F/VAR*		
R 35	1	608-09-49900	624	RES. 4.99K 1% 1/10W	EMR	608-09-49900
R 36	1	999-01-00023	22383	RES,*F/VAR*		
R 37	1	999-01-00024	22383	RES,*F/VAR*		
R 38	1	999-01-00025	22383	RES,*F/VAR*		
R 39	1	608-09-13000	624	RES 1.30K 1% 1/10W	EMR	608-09-13000
R 40	1	608-09-34800	624	RES, 3.48K 1% 1/10W	EMR	608-09-34800
R 41	1	999-01-00026	22383	RES,*F/VAR*		
R 42	1	616-02-82009		RES,820 OHM 5% 1/4W	ALLEN BRAD	RC07GF821J
TP 1	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102

FIRST USAGE MODEL 0660

Table 4 (Cont'd.). EMR 660-02 Parts List

205-89-01264 22376-1 SHT 3 OF 3

ITEM NO.	QTY REQD	EMR NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
TP 2	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102
TP 3	1	143-98-00005		JACK,TEST,BLACK	MML 16	8041-1G6/MML 16
U 1	1	046-97-00138		IC,LIN COMPTR,DIFF PS	TI/MML40	SN72710L
U 2	1	046-97-00141		IC,LIN COMPTR,W/STROBE	TI/MML40	SN72711L
U 3 THRU	3	046-97-00135		IC,LIN AMPL,OPNL,COMPEN	TI/MML40	SN72741L
U 5						
REF 1	1	905-01-00908	22374	SCHEMATIC,PWA,DISCR	EMR	905-01-00908
REF 2	1	905-05-00308	22383	VARIABLE CHART,MOD 66(	EMR	905-05-00308
REF 3	1	905-07-00230	22857	SPEC,ENGRG,MODEL 660	EMR	905-07-00230
REF 4	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

FIRST USAGE MODEL 0660

Table 5. EMR 660-11 Parts List

PARTS LIST 22376-2 REV DATE 05/14/75 REV LTR C

LIST TITLE PWA,DISCRIMINATOR CHGE CONT NO. CODE IDENT SHT 1 OF 3
PART NO. 205-89-01483 ECO RECORD 1 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-C0862	22375	PWB, DISCRIMINATOR	EMR	204-99-C0862
5	AR	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008
C 1	1	337-12-22C04	601	CAP., 22MF 10% 15V	EMR	337-12-22C04
C 2	1	999-01-00001	22383	CAP.,*F/VAR*		
C 4	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 5	1	999-01-00002	22383	CAP.,*F/VAR*		
C 6	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 7	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 8	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 9	1	999-01-00003	22383	CAP.,*F/VAR*		
C 10	1	999-01-00004	22383	CAP.,*F/VAR*		
C 11	1	999-01-00027	22383	CAP.,*F/VAR*		
C 12	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 13	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 14	1	999-01-00005	22383	CAP.,*F/VAR*		
C 15	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 16	1	337-12-22C04	601	CAP., 22MF 10% 15V	EMR	337-12-22C04
C 17	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 18	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 19	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 20	1	999-01-00014	22383	CAP.,*F/VAR*		
C 21	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 22	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 23	1	999-01-00015	22383	CAP.,*F/VAR*		
C 25	1	999-01-00015	22383	CAP.,*F/VAR*		
C 26	1	999-01-00015	22383	CAP.,*F/VAR*		
C 27	1	999-01-00016	22383	CAP.,*F/VAR*		
C 28 THRU C 30	3	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
CR 2	1	088-99-00119	642-13	DIODE,ZENER 0.4W 12.0V	EMR	088-99-00119
CR 3	1	088-10-09360		DIODE,REF,9V/7.5MA,.005 %	MML 2	1N936/1N936A/1N936B
CR 4	1	088-99-00209	642-10	DIODE,ZENER 0.4W 8.2V	EMR	088-99-00209
CR 5	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
CR 6	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 7	1	088-10-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 8	1	088-97-08230		DIODE,REF. 6.2V@7.5MA	MML 2	1N823
CR 12	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
L 1	1	999-01-00006	22383	L,ASSY,*F/VAR*		
L 2	1	999-01-00007	22383	L,ASSY,*F/VAR*		
L 3	1	999-01-00008	22383	L,ASSY,*F/VAR*		
L 4	1	044-98-00006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 10/3B
L 5	1	044-98-00006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 10/3B
Q 1	1	263-97-41210		XSTR,PNP,RF SWITCH/AMPL	MML4	2N4121
Q 2	1	263-10-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565

FIRST USAGE MODEL C660-11

Table 5 (Cont'd.). EMR 660-11 Parts List

205-89-01483 22376-2 SHT 2 OF 3

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
Q 3	1	263-10-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565
Q 4	1	263-10-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
Q 5	1	263-10-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
R 1	1	616-02-12009		RES,120 OHM 5% 1/4W	ALLEN BRAD	RC07GF121J
R 2	1	616-02-39009		RES,390 OHM 5% 1/4W	ALLEN BRAD	RC07GF391J
R 3	1	201-98-00138		POT,TRMR,1.0 K 10%.75W	BECK/MML27	79PR1K
R 4	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 5	1	616-02-30000		RES,3K 5% 1/4W	ALLEN BRAD	RC07GF302J
R 6	1	616-02-47009		RES,470 OHM 5% 1/4W	ALLEN BRAD	RC07GF471J
R 7	1	608-09-68100	624	RES. 6.81K 1% 1/10W	EMR	608-09-68100
R 8	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 9	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 10	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R 11	1	999-01-00009	22383	RES.,*F/VAR*		
R 12	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 13	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 14	1	999-01-00010	22383	RES.,*F/VAR*		
R 15	1	999-01-00011	22383	RES.,*F/VAR*		
R 16	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 17	1	999-01-00012	22383	RES.,*F/VAR*		
R 18	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 19	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 20	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 21	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 22	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 23	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R 24	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 25	1	616-02-36009		RES,360 OHM 5% 1/4W	ALLEN BRAD	RC07GF361J
R 26	1	999-01-00017	22383	RES,*F/VAR*		
R 27	1	999-01-00018	22383	RES,*F/VAR*		
R 28	1	999-01-00019	22383	RES,*F/VAR*		
R 29	1	608-09-16900	624	RES. 1.69K 1% 1/10W	EMR	608-09-16900
R 30	1	201-98-00148		PCT,TRMR, 10 K 10%.75W	BECK/MML27	79PR10K
R 31	1	999-01-00020	22383	RES,*F/VAR*		
R 32	1	999-01-00021	22383	RES,*F/VAR*		
R 33	1	999-01-00022	22383	RES,*F/VAR*		
R 34	1	999-01-00013	22383	RES,*F/VAR*		
R 35	1	608-09-49900	624	RES. 4.99K 1% 1/10W	EMR	608-09-49900
R 36	1	999-01-00023	22383	RES,*F/VAR*		
R 37	1	999-01-00024	22383	RES,*F/VAR*		
R 38	1	999-01-00025	22383	RES,*F/VAR*		
R 39	1	608-09-13000	624	RES 1.30K 1% 1/10W	EMR	608-09-13000
R 40	1	608-09-34800	624	RES, 3.48K 1% 1/10W	EMR	608-09-34800
R 41	1	999-01-00026	22383	RES,*F/VAR*		
R 42	1	616-02-82009		RES,820 OHM 5% 1/4W	ALLEN BRAD	RC07GF821J
TP 1	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102
TP 2	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102
TP 3	1	143-98-00005		JACK,TEST,BLACK	MML 16	8041-1G6/MML 16
U 1	1	046-97-00138		IC,LIN COMPTR,DIFF HS	TI/MML40	SN7271CL

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Table 5 (Cont'd.). EMR 660-11 Parts List

205-89-01483 22376-2 SHT 3 OF 3

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
U 2	1	046-97-00141		IC,LIN COMPTR,W/STROBE	TI/MML40	SN72711L
U 3	3	046-97-00135		IC,LIN AMPL,OPNL,COMPEN	TI/MML40	SN72741L
THRU						
U 5						
REF 1	1	905-01-00908	22374	SCHEMATIC,PWA,DISCR	EMR	905-01-00908
REF 2	1	905-05-00308	22383	VARIABLE CHART,MOD 660	EMR	905-05-00308
REF 3	1	905-07-00230	22857	SPEC,ENGRG,MODEL 660	EMR	905-07-00230
REF 4	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

FIRST USAGE MODEL 0660-11

Table 6. EMR 660-12 Parts List

PARTS LIST 22376-3 REV DATE 09/04/75 REV LTR D

LIST TITLE PWA,DISCRIMINATOR CHGE CONT NO. CODE IDENT SHT 1 OF 3
PART NO. 205-89-01484 ECO RECORD 2 06141 CKD BY

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
1	1	204-99-00862	22375	PWB, DISCRIMINATOR	EMR	204-99-00862
5	AR	276-99-00008	619-22	WIRE,#22,BUSS,SOLID	EMR	276-99-00008
C 1	1	337-12-22004	601	CAP., 22MF 10% 15V	EMR	337-12-22004
C 2	1	999-01-00001	22383	CAP.,*F/VAR*		
C 4	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 5	1	999-01-00002	22383	CAP.,*F/VAR*		
C 6	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 7	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 8	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 9	1	999-01-00003	22383	CAP.,*F/VAR*		
C 10	1	999-01-00004	22383	CAP.,*F/VAR*		
C 11	1	999-01-00027	22383	CAP.,*F/VAR*		
C 12	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 13	1	301-13-10002		CAP,CR , 50V .100 UF 20%	MML 48	8131-050-651-104M/MML
C 14	1	999-01-00005	22383	CAP.,*F/VAR*		
C 15	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 16	1	337-12-22004	601	CAP., 22MF 10% 15V	EMR	337-12-22004
C 17	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 18	1	337-14-68003	601	CAP. 6.8MF 10% 35V	EMR	337-14-68003
C 19	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 20	1	999-01-00014	22383	CAP.,*F/VAR*		
C 21	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 22	1	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
C 23	1	999-01-00015	22383	CAP.,*F/VAR*		
C 25	1	999-01-00015	22383	CAP.,*F/VAR*		
C 26	1	999-01-00015	22383	CAP.,*F/VAR*		
C 27	1	999-01-00016	22383	CAP.,*F/VAR*		
C 28	3	301-71-10001		CAP, .01UF +80-20% 100V	ERIE/MALLORY	805C00Z5U0103Z/TA-.01
THRU						
C 30						
CR 2	1	088-99-00119	642-13	DIODE,ZENER 0.4W 12.0V	EMR	088-99-00119
CR 3	1	088-1C-09360		DIODE,REF,9V/7.5MA,.005 %	MML 2	1N936/1N936A/1N936B
CR 4	1	088-99-00209	642-10	DIODE,ZENER 0.4W 8.2V	EMR	088-99-00209
CR 5	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
CR 6	1	088-1C-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 7	1	088-1C-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 8	1	088-97-08230		DIODE,REF. 6.2V@7.5MA	MML 2	1N823
CR 10	1	088-1C-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 11	1	088-1C-41480		DIODE,SW,75V/5UA,4NS/10MA	JEDEC	1N4148
CR 12	1	088-99-00249	642-08	DIODE,ZENER 0.4W 6.8V	EMR	088-99-00249
K 1	1	219-99-00013	28531-6	RELAY,1 FORM C,GOLD CONT	EMR	219-99-00013
L 1	1	999-01-00006	22383	L,ASSY,*F/VAR*		
L 2	1	999-01-00007	22383	L,ASSY,*F/VAR*		
L 3	1	999-01-00008	22383	L,ASSY,*F/VAR*		
L 4	1	044-98-00006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 10/3B

FIRST USAGE MODEL 0660-12

Table 6 (Cont'd.). EMR 660-12 Parts List

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
L 5	1	044-98-CC006		CHOKE,FERRITE,0.75K/50MHZ	FERROXCUBE	VK200 1C/3B
Q 1	1	263-97-41210		XSTR,PNP,RF SWITCH/AMPL	MML4	2N4121
Q 2	1	263-1C-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565
Q 3	1	263-1C-35650		XSTR,NPN 40MHZ,30V AMPL	JEDEC	2N3565
Q 4	1	263-1C-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
Q 5	1	263-1C-36460		XSTR,NPN 40V,300MA SW,ON	JEDEC	2N3646
R 1	1	616-02-12009		RES,120 OHM 5% 1/4W	ALLEN BRAD	RC07GF121J
R 2	1	616-02-39009		RES,390 OHM 5% 1/4W	ALLEN BRAD	RC07GF391J
R 3	1	201-98-00138		POT,TRMR,1.0 K 10%.75W	BECK/MML27	79PR1K
R 4	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 5	1	616-02-30000		RES,3K 5% 1/4W	ALLEN BRAD	RC07GF302J
R 6	1	616-02-47009		RES,470 OHM 5% 1/4W	ALLEN BRAD	RC07GF471J
R 7	1	608-09-68100	624	RES. 6.81K 1% 1/10W	EMR	608-09-68100
R 8	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 9	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 10	1	616-02-51009		RES,510 OHM 5% 1/4W	ALLEN BRAD	RC07GF511J
R 11	1	999-01-00009	22383	RES,*F/VAR*		
R 12	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 13	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 14	1	999-01-00010	22383	RES,*F/VAR*		
R 15	1	999-01-00011	22383	RES,*F/VAR*		
R 16	1	616-02-10000		RES,1K 5% 1/4W	ALLEN BRAD	RC07GF102J
R 17	1	999-01-00012	22383	RES,*F/VAR*		
R 18	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 19	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 20	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 21	1	616-02-20000		RES,2K 5% 1/4W	ALLEN BRAD	RC07GF202J
R 22	1	616-02-10002		RES,100K 5% 1/4W	ALLEN BRAD	RC07GF104J
R 23	1	616-02-10001		RES,10K 5% 1/4W	ALLEN BRAD	RC07GF103J
R 24	1	608-09-20000	624	RES. 2.0K 1% 1/10W	EMR	608-09-20000
R 25	1	616-02-36009		RES,360 OHM 5% 1/4W	ALLEN BRAD	RC07GF361J
R 26	1	999-01-00017	22383	RES,*F/VAR*		
R 27	1	999-01-00018	22383	RES,*F/VAR*		
R 28	1	999-01-00019	22383	RES,*F/VAR*		
R 29	1	608-09-16900	624	RES. 1.69K 1% 1/10W	EMR	608-09-16900
R 30	1	201-98-00148		POT,TRMR, 10 K 10%.75W	BECK/MML27	79PR10K
R 31	1	999-01-00020	22383	RES,*F/VAR*		
R 32	1	999-01-00021	22383	RES,*F/VAR*		
R 33	1	999-01-00022	22383	RES,*F/VAR*		
R 34	1	999-01-00013	22383	RES,*F/VAR*		
R 35	1	608-09-49900	624	RES. 4.99K 1% 1/10W	EMR	608-09-49900
R 36	1	999-01-00023	22383	RES,*F/VAR*		
R 37	1	999-01-00024	22383	RES,*F/VAR*		
R 38	1	999-01-00025	22383	RES,*F/VAR*		
R 39	1	608-09-13000	624	RES 1.30K 1% 1/10W	EMR	608-09-13000
R 40	1	608-09-34800	624	RES, 3.48K 1% 1/10W	EMR	608-09-34800
R 41	1	999-01-00026	22383	RES,*F/VAR*		
R 42	1	616-02-82009		RES,820 OHM 5% 1/4W	ALLEN BRAD	RC07GF821J
TP 1	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102

FIRST USAGE MODEL 0660-12

Table 6 (Cont'd.). EMR 660-12 Parts List

205-89-01484 22376-3 SHT 3 OF 5

ITEM NO.	QTY REQD	E M R NUMBER	DRAWING OR SPEC NO.	DESCRIPTION	VENDOR NAME	VENDOR PART NUMBER
TP 2	1	143-98-00051		JACK,TEST PT,PW TYPE,RED	MML 16	430-102
TP 3	1	143-98-00005		JACK,TEST,BLACK	MML 16	8041-1G6/MML 16
U 1	1	046-97-00138		IC,LIN COMPTR,DIFF FS	TI/MML40	SN72710L
U 2	1	046-97-00141		IC,LIN COMPTR,W/STROBE	TI/MML40	SN72711L
U 3 THRU U 5	3	046-97-00135		IC,LIN AMPL,OPNL,COMPEN	TI/MML40	SN72741L
REF 1	1	905-01-00908	22374	SCHEMATIC,PWA,DISCR	EMR	905-01-00908
REF 2	1	905-05-00308	22383	VARIABLE CHART,MOD 660	EMR	905-05-00308
REF 3	1	905-07-00230	22857	SPEC,ENGRG,MODEL 660	EMR	905-07-00230
REF 4	1	905-04-00001	9500	SPEC,COMPONENT SPACING	EMR	905-04-00001

FIRST USAGE MODEL 0660-12

Table 7. Vendor List

ABBREV.	VENDOR NAME AND ADDRESS
ALLEN BRAD	Allen-Bradley Co., Milwaukee, Wis.
AUGAT	Augat, Inc., Attleboro, Mass.
BOURNS	Bourns, Inc., Riverside, Calif.
E.F. JOHNSON	E.F. Johnson Co., Waseca, Minn.
EMR-T	EMR-Telemetry, Div. of Weston Instruments, Inc., Sarasota, Florida
ERIE	Erie Technological Products, Inc., Erie, Pa.
FCH	Fairchild Camera and Instrument Corp., Mountain View, Calif.
FERROXCUBE	Ferroxcube Corp. of America, Saugerties, Calif.
HATHAWAY	Hathaway Instruments, Inc., Denver, Colorado
JEDEC	Any Qualified Vendor
MOTOROLA	Motorola Semiconductor Products, Inc., Phoenix, Ariz.
T.I.	Texas Instrument, Inc., Dallas, Texas

APPENDIX

REVISIONS				
SYM	DESCRIPTION	EFFECTIVITY	DATE	APPROVED

31663

ADDENDUM

MODEL 636-01-M1 PRESAMPLE FILTER

		DRAWN BY N. Davis	DATE 5/16/76	EMR TELEMETRY WESTON INSTRUMENTS INC BOX 3041·SARASOTA FLORIDA 33578
		DESIGNER		MODIFICATION DRAWING PRESAMPLE FILTER MODEL 636-M1
		CHECKER		
		DESIGN ENGINEER E. Pendell	5/16/76	
FINAL	C5123	PROJECT ENGINEER	5/16/76	
NEXT ASSY NO.	USED ON	APPROVED		
APPLICATION				
III	II	APPROVED		
GRADE	CATEGORY			

SIZE	CODE IDENT NO.	DRAWING NO.	REV
A	06141	31663	

SCALE —H— SHEET 1A OF 3

EMR 3/2/31C

GENERAL:

This document describes the requirements to convert a standard Model 636 Presample Filter, Assy No. 31493 to a Model 636-M1.

PURPOSE:

The purpose of the -M1 is to delete 6 of the 8 filters and change the frequency of one of the remaining filters from 20 Hz CA to 10 Hz CA.

MODIFICATIONS:

The following steps are required to perform the modification:

1. Assemble a special network to the 31522-1 configuration using the following components:

Component	Value	Stock Control No.
R1	200K	608-09-20002
C1	.01 µf	301-03-10001
R2	100K	608-09-10002
R3	100K	608-09-10002
R4	100K	608-09-10002
R5	100K	608-09-10002
R6	200K	608-09-20002

2. Assemble PWA No. 31493 using only the following parts:

Item	Qty.	Part No.	Description
1	1	31492	PWB, Presample Filter
2	2	236-98-00063	Socket, IC, 14 Pin Dip, Solder
C1,C2	2	301-03-10001	Cap, .01 µf 20% 50V
C3,C7	2	384-05-48001	Cap, .048 µf. 1% 50V
C4,C9	2	384-05-33002	Cap, .33 µf 1% 50V
C5,C10	2	384-05-13202	Cap, .132 µf 1% 50V
C6,C8	2	384-05-11202	Cap, .112 µf 1% 50V
C41,C42	2	338-14-15004	Cap, 15 µf 10% 35V

EDC

SIZE	CODE IDENT NO.	DRAWING NO.	
A	06141	31663	
SCALE —11—		SHEET 2	

Item	Qty.	Part No.	Description
R1, R6	2	201-98-00300	Pot, 25K 10% .75W
R2, R7	2	608-09-20001	Res, 20K 1% 1/10W
R3, R8	2	608-09-04999	Res, 49.9 Ohm 1% 1/10W
R5, R10	2	616-02-20009	Res, 200 Ohm 5% 1/4W
U1	1	046-97-00234	IC, Lin Amp, Quad 741
Z1	1	31522	NTWK, 1 Cap, 6 Res.
Z3	1	Network Built in Mod Step 1	
Ref 1	1	31491	Schematic

3. Mark PWA with Assy No. 31663 and Model No. 636-M1 using Black Ink, Color No. 27038 per Spec 902401.

4. Signals at the Connector of the PWA are as follows:

Connector Pin	Signal
6 & F	-15V
7 & H	+15V
8 & J	Gnd - Pwr Rtn & Input Rtns
17	Gnd - Output Rtns
2	10 Hz Filter In
P	10 Hz Filter Out
A	20 Hz Filter In
S	20 Hz Filter Out

TESTING:

Test procedures of the STD card apply to the 2 Filters on the PWA.

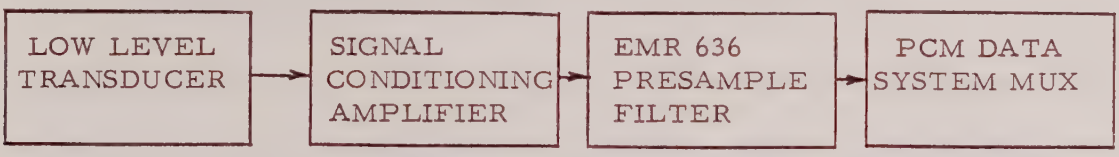
SIZE	CODE IDENT NO.	DRAWING NO.	
A	06141	31663	
SCALE			SHEET 3

EMR 3/2/24A

EMR 636 (ASSEMBLY 31493) PRESAMPLE FILTER

1. GENERAL

The EMR 636 Presample Filter is part of the EMR 600-Series telemetry products designed for use in data acquisition applications. The card contains eight, identical filter channels. Each channel is a four-pole Butterworth filter. The purpose of these channels is to provide low-frequency filtering of analog inputs prior to sampling for analog-to-digital conversion. Although other frequencies can be obtained, the cutoff (corner) frequency of each channel is fixed at 20 Hz. A typical application of the EMR 636 is shown below.



2. TYPICAL CHARACTERISTICS

2.1 Electrical

Typical characteristics of each filter channel are as follows:

a.	Type:	4-pole Butterworth Low Pass
b.	Corner Frequency (fc) (0.5 dB):	20 Hz fixed
c.	Corner Frequency Tolerance:	± 3% of value
d.	V_{in} and V_{out} ranges:	± 10V, non-inverting
e.	Gain:	0 ± 0.05 dB
f.	Output Offset Voltage:	± 5 mV maximum
g.	Output Current:	To ± 2 mA, short circuit protected
h.	Output Impedance:	1 ohm maximum
i.	Input Impedance:	30k ohm minimum
j.	Thermal Drifts:	Frequency ± 0.05%/° C max. Offset ± 50 µV/° C max.
k.	Output Noise:	200 µV rms, DC to 10 kHz

2.2 Mechanical and Environmental

a. Card Size: 4-1/2 inches high by 6-1/2 inches long.

b. Connectors: Cards contain a printed connector which plugs into a 22-pin mating receptacle in the mounting equipment. Mating receptacle is a Cinch 251-22-30-160.

c. Mounting: Intended for mounting in EMR 600-Series System Equipment Cases. Several equipment cases are available for use with various system configurations.

d. Operating Temperature Range: 32° F to 158° F.

3. INSTALLATION

The EMR 636 is designed for mounting in an EMR Assembly 31670 equipment case. A printed connector on the card mates with a 22-pin, double-sided receptacle in the equipment case. Electrical connections to the card are terminated at the mating receptacle. Table 1 identifies I/O connections, the offset resistor and the gain resistor for each channel. Table 2 is the associated parts list. Figure 1 is the assembly diagram and Figure 2 is the schematic diagram for the 636.

4. OFFSET AND GAIN ADJUSTMENT

If adjustment of any channel(s) is required, proceed as listed below. Table 1 identifies offset and gain resistors for each channel. Figure 3 pinpoints location of offset resistors.

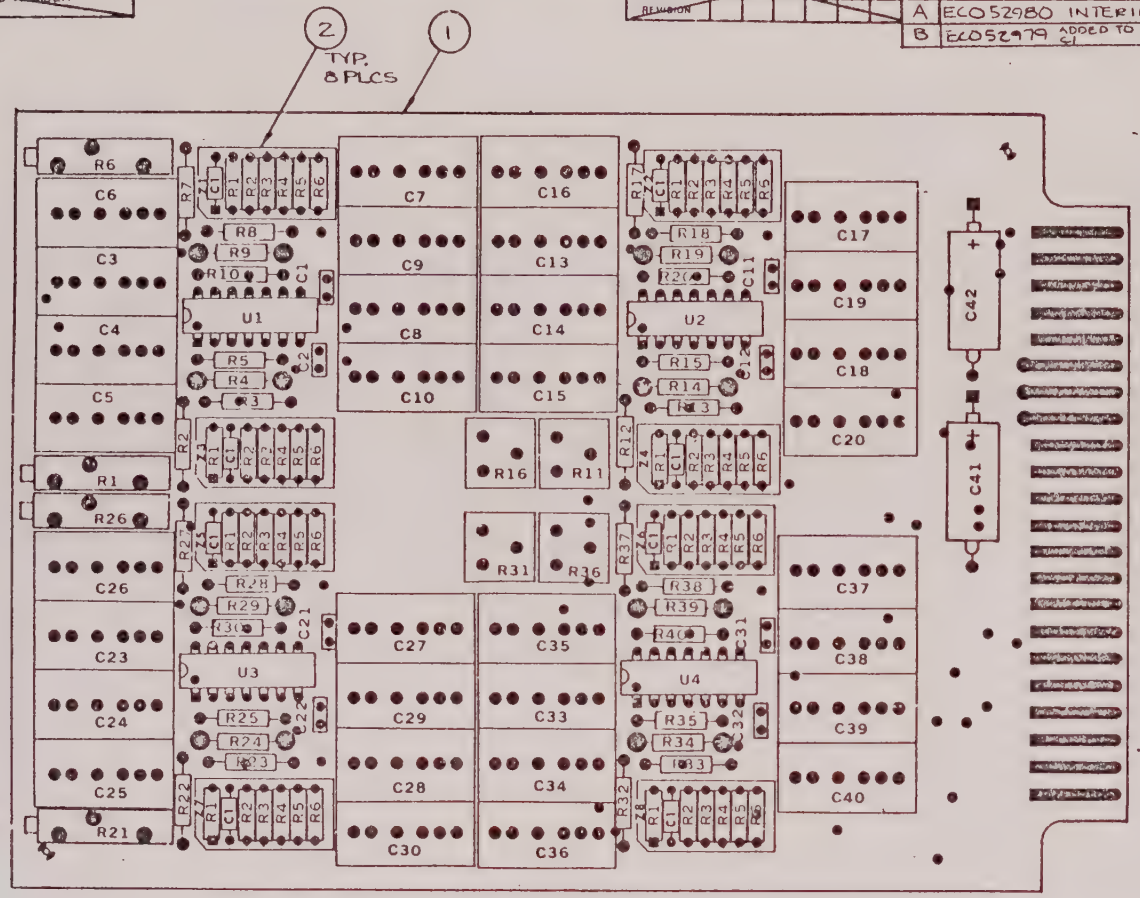
a. Remove gain resistor.

b. Adjust offset resistor to provide (0V) null output. The offset resistor allows ±40 mV adjustment.

c. Install appropriate (test variable) gain resistor to obtain a gain of 1.

6. MAINTENANCE

Maintenance to the card consists of replacing a defective component should a malfunction occur. Offset and gain adjustment is described in paragraph 4.



HOLE/COMPONENT CHART

LAST NO USED	DESCRIPTION/UNUSED NUMBER
HOLE	CUT

ARTWORK REVISION INDEX

SHEET NO	
REVISION	

REVISIONS

SYM	DESCRIPTION	EFFECTIVITY	DATE	APPROVED
A	ECO52980 INTERIM	EFFT ON ALL CARDS	JAN 5, 1976	
B	ECO52979 ADDED TO S1 THRU 8	EFFT ON ALL CARDS	JAN 5, 1976	

3. ■ SQUARE PAD INDICATES (+) POSITIVE END OF CAPACITORS, CATHODE END OF DIODES AND MECHANICAL ORIENTATION OF SYMMETRICAL MULTI-LEADED DEVICES.

2. DESIGN REF. HEIGHT:

1. MAX ASSY HEIGHT:
   A. COMPONENT SIDE: .550
   B NONCOMPONENT SIDE: .093

UNLESS OTHERWISE SPECIFIED:
NOTES

GRADE	CATEGORY	SIMILAR TO
II	H	—

BSC	FINAL	636
CASH NO	NEXT ASSY NO	USED ON

APPLICATION

DO NOT APPLY PART NO IDENTIFY PER EMR 13408

LOCATE APPROX AS SHOWN

CONFIGURATION	CONTROL NO.	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	ITEM OR SYMBOL
QTY REQUIRED				
-1 BASIC		PL-31493	FOR PARTS LIST SEE PL-31493	—

PARTS LIST

UNLESS OTHERWISE SPECIFIED
TOLERANCES — DECIMALS: XX ± .03, XXX ± .010; ANGLES: ± ½°; SURFACE FINISH: .125 ✓
DIMENSIONS ARE IN INCHES
THREADS CLASS 2A OR 2B PER MIL-S-7742
REMOVE BURRS AND BREAK EDGES .010 MAX.
HOLE TOLERANCES PER EMR SPEC 3018
DIMENSIONS INCLUDE APPLIED FINISH
EMR WORKMANSHIP STANDARDS APPLY
DO NOT SCALE DRAWING

MATERIAL —

TREATMENT OR FINISH —

	NAME	DATE
DRAWN BY	J.A. GRAHAM	
DESIGNER	J.A. GRAHAM	
CHECKER		11-20-75
DESIGN ENGINEER		
PROJECT ENGINEER		11-20-75
APPROVED		
APPROVED		11-20-75

EMR — EMR TELEMETRY, WESTON INSTRUMENTS, INC, SARASOTA, FLORIDA 33578

Schlumberger

PRINTED WIRING ASS'Y
PRESAMPLE FILTER

EDC

SIZE	CODE IDENT NO.	DRAWING NO.	REV
C	06141	31493	B

SCALE 2/1 — SHEET 1 OF 1

LIMITED CHANGE CONTROL

Figure 1. EMR 636 Presample Filter Card Assembly Diagram

PL-31493

REVISIONS				
SYM	DESCRIPTION	EFFECTIVITY	DATE	APPROVED
A	ECO 52978 VALUE CHANGED, C,7,27,37, R5,10,15,20,25,30,35,40.	EPPT 1 UP	JAN 5 1976	

Table 2. EMR 636 Presample Filter Card Assembly Parts List

9 C3, 7, 13, 17, 23, 27, 33, 37

8 R2, 7, 12, 17, 22, 27, 32, 37.

7 R4, 9, 14, 19, 24, 29, 34, 39.

6 R5, 10, 15, 20, 25, 30, 35, 40.

5 R3, 8, 13, 18, 23, 28, 33, 38.

4 C5, 10, 15, 20, 25, 30, 36, 40 .

3 C4, 9, 14, 19, 24, 29, 34, 38,

2 C6, 8, 16, 18, 26, 28, 35, 39

1 C1, 2, 11, 12, 21, 22, 31, 32 .

NOTES: UNLESS OTHERWISE SPECIFIED:

		DRAWN BY J.A.GRAHAM	DATE NOV 11, 1975	EMR / EMR Schlumberger	EMR TELEMETRY WESTON INSTRUMENTS, INC BOX 3041•SARASOTA FLORIDA 33578
		DESIGNER J.A.GRAHAM	NOV 11 1975		
		CHECKER	11-20-75	PARTS LIST, PWA	
		DESIGN ENGINEER		PRESAMPLE FILTER	
31493	636	PROJECT ENGINEER	11/20/75		
NEXT ASSY NO.	USED ON	APPROVED		SIZE A	CODE IDENT NO. 06141
APPLICATION				DRAWING NO. PL-31493	REV A
II	II	APPROVED 11-20-75		SCALE —	SHEET 1 OF 3
GRADE	CATEGORY				

REQD	DWG SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT	ITEM OR SYMBOL
4		201-98-00349	POT, TRMR, 25K 10% .5W 100PPM		R11,16 31,36
8		608-09-20001	RES., 20K 1% 1/10W		8
8		608-09-XXXXX	RES., *TVAR*		7
8		616-02-20009	RES., 2000HM 5% 1/4W		6
4		201-98-00300	POT, TRMR, 25K 10% .75W 100PPM		R1, 6, 21, 26
8		608-09-04999	RES., 49.90HM 1% 1/10W		5
2		338-14-15004	CAP., 15MF 10% 35V		C41,42
8		384-05-13202	CAP., .1320 MF 1% 50V		4
8		384-05-33002	CAP., .3300MF 1% 50V		3
8		384-05-11202	CAP., .112MF 1% 50V		2
8		384-05-48001	CAP., .0480 MF 1% 50V		9
8		301-03-10001	CAP., .01MF 20% 50V LS.100		1
8		236-98-00063	SOCKET, IC 14PIN SOLDER DIP		2
1	C	31492	PWB, PRESAMPLE FILTER		1

SIZE A | SCALE — | CODE IDENT NO. 06141 | DRAWING NO. PL-31493 | SHEET 2 | REV A

3/2/88

REQD	DWG SIZE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT	ITEM OR SYMBOL
1	A	905-04-00001	SPEC, COPONENT SPACING, (9500)		REF 2
1	D	31491	SCHEM, PWA, PREAMPLE FILTER		REF 1
4		31522-1	NTWK, 6 RES		R3, R4, R7, R8
4		31522	NTWK, 6 RES		R1, R2, R5, R6
4		046-97-00234	IC, LIN, AMPL, OPNL, QUAD 741		U1-4

SIZE A | CODE IDENT NO. 06141 | DRAWING NO. PL-31493 | SHEET 3 | REV

SCALE —

3/27/488

A 6

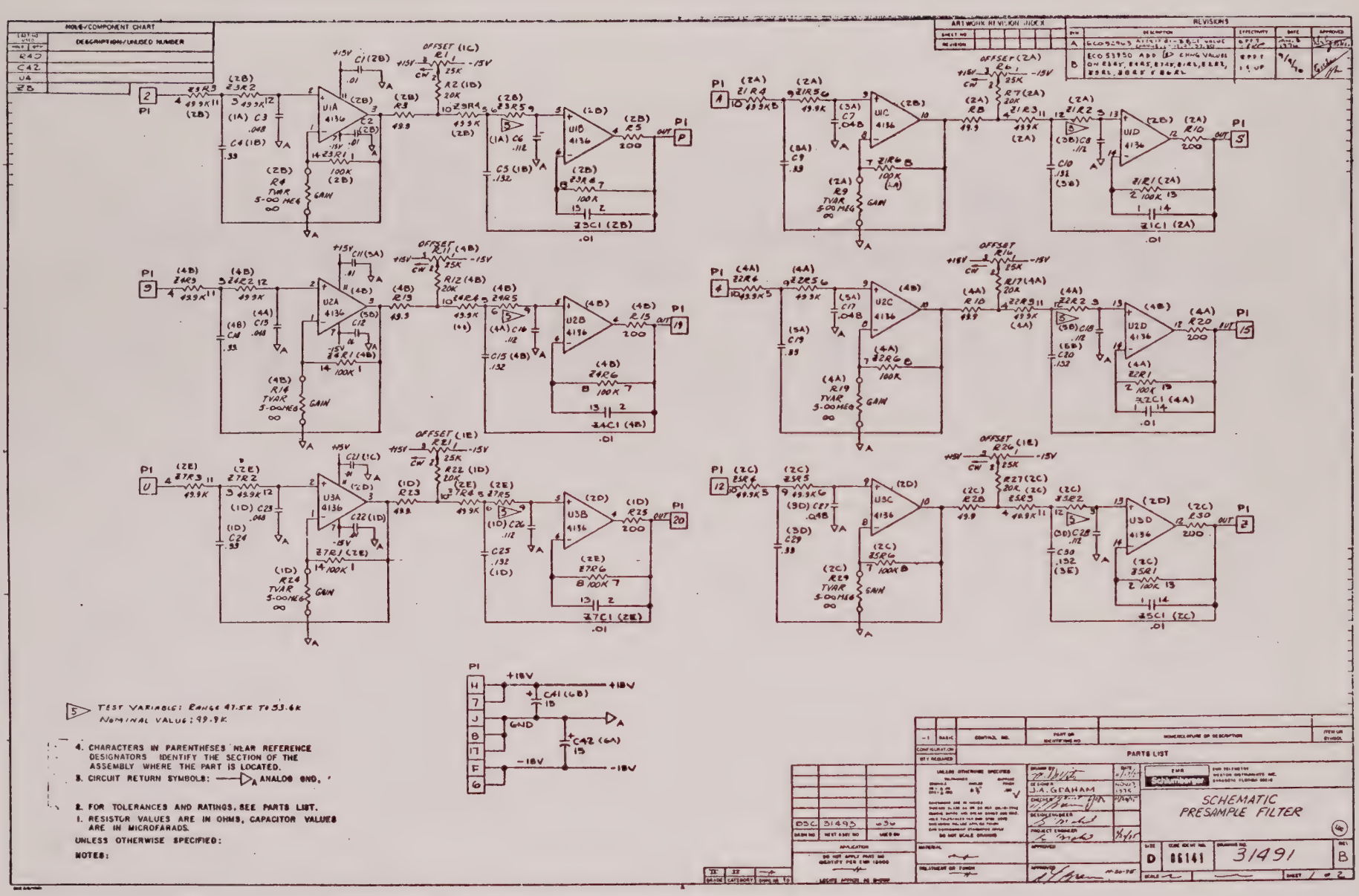
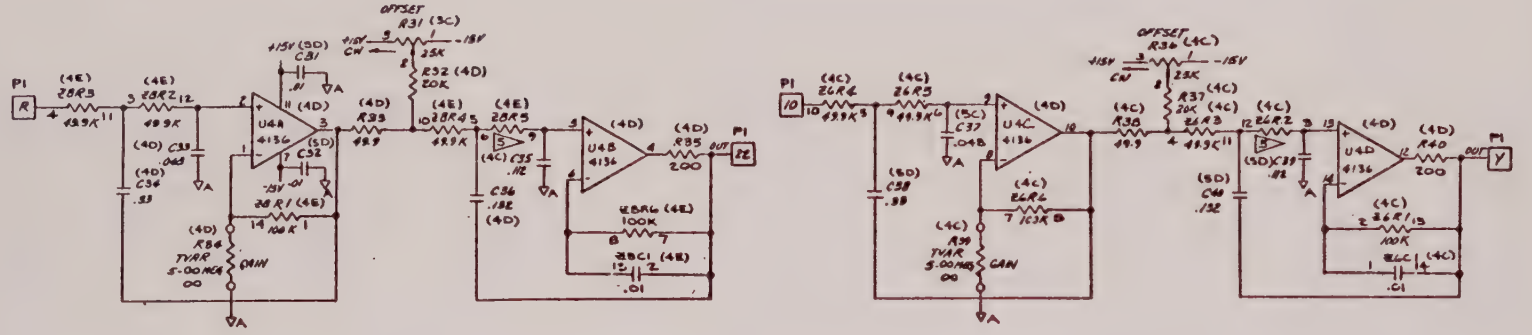


Figure 2. EMR 636 Presample Filter Card Schematic Diagram



SCHEMATIC
PRESAMPLE FILTER

SIZE	CODE IDENT NO.	DRAWING NO.	REV
D	86141	31491	B

SCALE — SHEET 2 OF 2

Figure 2. EMR 636 Presample Filter Card Schematic Diagram

Table 1. Identification of Channel I/O Pins, Gain Adjust Resistors & Offset Adjust Resistors

CHANNEL NO.	INPUT PIN	OUTPUT PIN	OFFSET ADJUST	GAIN ADJUST
1	2	P	R1	R4
2	A	S	R6	R9
3	9	19	R11	R14
4	4	15	R16	R19
5	U	20	R21	R24
6	12	Z	R26	R29
7	R	22	R31	R34
8	10	Y	R36	R39

7. PARTS LIST

A parts list of components on the 636 is provided as Table 2 which lists all components by item number or reference designation. Total quantity of a component is provided in the REQ'D column. Each part is assigned an EMR stock (or assembly) number as listed in the PART OR IDENTIFYING NO. column. A component description is provided in the NOMENCLATURE OR DESCRIPTION column.

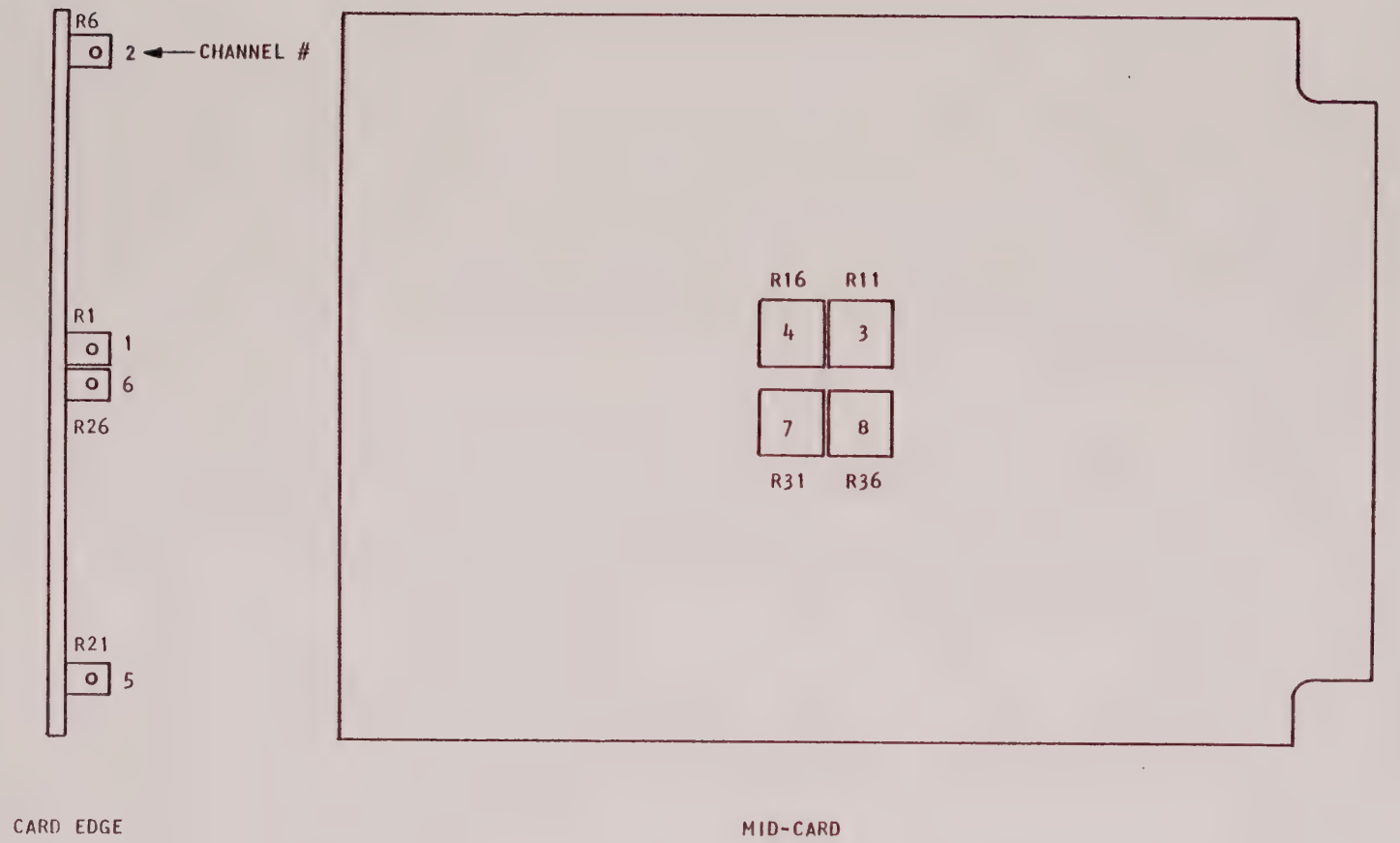


Figure 3. 636 Presample Filter Offset Adjustment Control Locations

TECHNICAL MANUAL UTILITY REPORT

At EMR, we continuously strive to produce high quality and usable technical manuals for our equipment. To help us in this regard, we request that after reading and using this manual, you record your comments and suggestions on this utility report and return it to EMR. When completed, remove this page from manual, fold on dotted lines, staple, and mail. Insert additional sheets if necessary.

Manual Title and Publication Date:

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Report Submitted By:

Name _____

Title _____

Orgn. _____

Date _____

Comments or Suggestions:

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